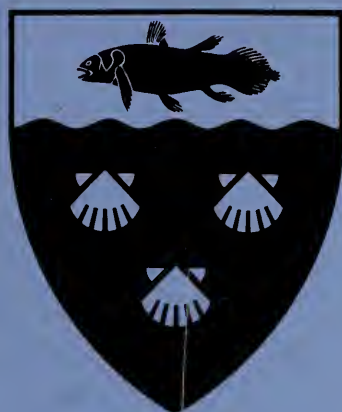


**J.L.B. SMITH INSTITUTE OF ICHTHYOLOGY**

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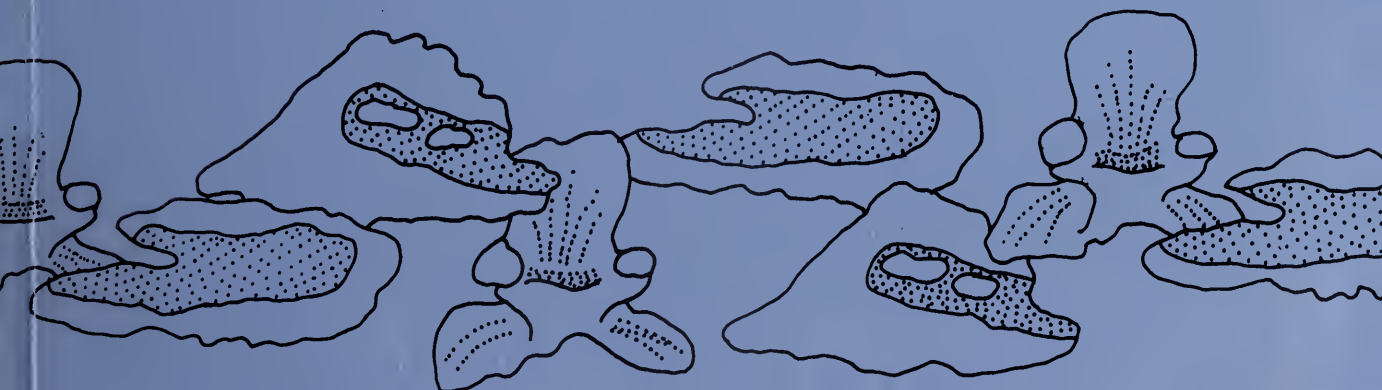
**JUNE 1995**

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### **OTOLITH ATLAS OF SOUTHERN AFRICAN MARINE FISHES**

by

Malcolm J. Smale, Gillian Watson and Thomas Hecht



## ABSTRACT

Smale, Malcolm J., Gillian Watson and Thomas Hecht. 1995. Otolith atlas of southern African marine fishes. *Ichthyological Monographs of the J.L.B. Smith Institute of Ichthyology*, No. 1, xiv, 253 pages, 149 plates.

Otoliths from 972 fish species representing 181 families occurring off the coast of southern Africa are described and illustrated to aid identification of otoliths from predator stomach contents, archaeological deposits or palaeontological studies. Keys are provided for most families to assist in the identification of species. Regressions relating otolith diameter to body length and mass are provided where adequate material is available. Otoliths used are listed and where appropriate, the institution which holds fish voucher specimens and their accession numbers are provided. Most of the material collected was from the western Indian Ocean and the south-eastern Atlantic, except for a few widely distributed species which were collected from the northern hemisphere or elsewhere. Significant disparities in otolith form within certain families are noted and may indicate taxonomic anomalies.

With grateful acknowledgement for financial contributions from the Foundation for Research Development, WWF South Africa (formerly The Southern African Nature Foundation) and Grinaker.

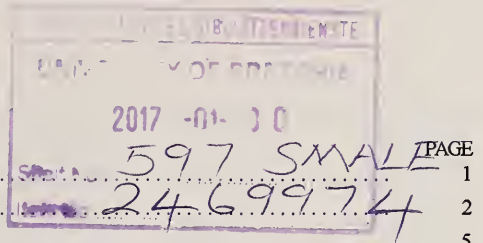


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Halosauridae	46	53.3	Halosauridae	<i>Halosauropsis macrochir</i>	1			12
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Moridae	171	90.5	Moridae	<i>Lepidion capensis</i>	27	1	56
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Gadidae	174	88.1	Gadidae	<i>Gaidropsarus capensis</i>	28	1	57
Merlucciidae	175	89.3	Merlucciidae	<i>Macruronus capensis</i>	28		58

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Merlucciidae	175	89.4	Merlucciidae	<i>Merluccius capensis</i>	29	1	58
Merlucciidae	175	89.5	Merlucciidae	<i>Merluccius paradoxus</i>	29	1	58
Macrouridae	176	93.-	Macrouridae	<i>Bathygadus cottoides</i>	29		60
Macrouridae	176	93.2	Macrouridae	<i>Bathygadus melanobranchus</i>	29		60
Macrouridae	176	93.4	Macrouridae	<i>Caelorinchus acanthiger</i>	29		60
Macrouridae	176	93.5	Macrouridae	<i>Caelorinchus braueri</i>	29	1	60
Macrouridae	176	93.8	Macrouridae	<i>Caelorinchus simorhynchus</i>	30	1	60
Macrouridae	176	93.7	Macrouridae	<i>Caelorinchus denticulatus</i>	30	1	61
Macrouridae	176	93.-	Macrouridae	<i>Caelorinchus kaiyomaru</i>	30		61
Macrouridae	176	93.-	Macrouridae	<i>Caelorinchus karrerae</i>	30		61
Macrouridae	176	93.-	Macrouridae	<i>Caelorinchus quadricristatus</i>	30		61
Macrouridae	176	93.9	Macrouridae	<i>Caelorinchus trunovi</i>	30		61
Macrouridae	176	93.12	Macrouridae	<i>Coryphaenoides striaturus</i>	30		62
Macrouridae	176	93.13	Macrouridae	<i>Coryphaenoides subserulatus</i>	30		62
Macrouridae	176	93.14	Macrouridae	<i>Gadomus capensis</i>	31		62
Macrouridae	176	93.21	Macrouridae	<i>Kuronezumia leonis</i>	31		62
Macrouridae	176	93.32	Macrouridae	<i>Lucigadus ori</i>	31	1	62
Macrouridae	176	93.16	Macrouridae	<i>Caelorinchus matamua</i>	31	1	63
Macrouridae	176	93.17	Macrouridae	<i>Malacocephalus laevis</i>	31	1	63
Macrouridae	176	93.18	Macrouridae	<i>Mesobius antipodum</i>	31		63
Macrouridae	176	93.19	Macrouridae	<i>Nezumia brevibarbata</i>	31		63
Macrouridae	176	93.22	Macrouridae	<i>Nezumia micronychodon</i>	31	1	63
Macrouridae	176	93.-	Macrouridae	<i>Nezumia umbracincta</i>	32		64
Macrouridae	176	93.27	Macrouridae	<i>Sphagemacrurus pumiliceps</i>	32		64
Macrouridae	176	93.28	Macrouridae	<i>Trachonurus villosus</i>	32		64
Macrouridae	176	93.29	Macrouridae	<i>Trachyrincus scabrus</i>	32		64
Macrouridae	176	93.31	Macrouridae	<i>Ventrifossa nasuta</i>	32		64
ORDER: OPHIDIIFORMES							
Ophidiidae	177	96.3	Ophidiidae	<i>Brotula multibarbata</i>	32		65
Ophidiidae	177	96.5	Ophidiidae	<i>Dicrolene intronigra</i>	32	1	65
Ophidiidae	177	96.9	Ophidiidae	<i>Genypterus capensis</i>	33	1	65
Ophidiidae	177	96.13	Ophidiidae	<i>Hoplobrotula gnathopus</i>	33		65
Ophidiidae	177	96.18	Ophidiidae	<i>Neobythites analis</i>	33		66
Ophidiidae	177	96.22	Ophidiidae	<i>Selachophidium guentheri</i>	33	1	66
Carapidae	178	97.-	Carapidae	<i>Encheliophis boraborensis</i>	33		66
Bythitidae	179	98.1	Bythitidae	<i>Bidenichthys capensis</i>	34		66
Bythitidae	179	98.3	Bythitidae	<i>Cataetx laticeps</i>	34		66
Bythitidae	179	98.4	Bythitidae	<i>Cataetx niki</i>	34		67
ORDER: BATRACHOIDIFORMES							
Batrachoididae	181	100.3	Batrachoididae	<i>Batrachichthys apiatus</i>	34		67
Batrachoididae	181	100.5	Batrachoididae	<i>Chatrabus hendersoni</i>	34		67
Batrachoididae	181	100.6	Batrachoididae	<i>Chatrabus melanurus</i>	34		67
ORDER: LOPHIIFORMES							
Lophiidae	182	101.2	Lophiidae	<i>Lophiodes mutilus</i>	34		68
Lophiidae	182	101.-	Lophiidae	<i>Lophius vaillanti</i>	34		68
Lophiidae	182	101.4	Lophiidae	<i>Lophius vomerinus</i>	34	1	68
Antennariidae	183	102.4	Antennariidae	<i>Antennarius hispidus</i>	35		68
Antennariidae	183	102.7	Antennariidae	<i>Antennarius striatus</i>	35		68
Antennariidae	183	102.9	Antennariidae	<i>Histrio histrio</i>	35		69
Chaunacidae	185	103.2	Chaunacidae	<i>Chaunax pictus</i>	35	1	69
Ogcocephalidae	186	104.2	Ogcocephalidae	<i>Halieutaea fitzsimonsi</i>	35	1	69
Ogcocephalidae	186	104.6	Ogcocephalidae	<i>Malthopsis luteus</i>	35		69
Ogcocephalidae	186	104.8	Ogcocephalidae	<i>Malthopsis tiarella</i>	35		69
Ceratiidae	188	105.2	Ceratiidae	<i>Ceratas ? tentaculatus</i>	36		70
Ceratiidae	188	105.3	Ceratiidae	<i>Cryptosaras couesii</i>	36		70
Himantolophidae	196	108.1	Himantolophidae	<i>Himantolophus groenlandicus</i>	36		70
ORDER: GOBIESOCIFORMES							
Gobiesocidae	198	110.1	Gobiesocidae	<i>Apletodon pellegrini</i>	36		70
Gobiesocidae	198	110.2	Gobiesocidae	<i>Chorisochismus dentex</i>	36	1	70
ORDER: CYPRINODONTIFORMES							
Exocoetidae	200	116.1	Exocoetidae	<i>Cheilopogon cyanopterus</i>	36		71
Exocoetidae	200	116.4	Exocoetidae	<i>Cheilopogon pinnatibarbatus altipennis</i>	36		71
Exocoetidae	200	116.-	Exocoetidae	<i>Cypselurus oligolepis</i>	36		71
Exocoetidae	200	116.6	Exocoetidae	<i>Exocoetus volitans</i>	37		72
Exocoetidae	200	116.7	Exocoetidae	<i>Hirundichthys rondeletii</i>	37		72
Exocoetidae	200	116.10	Exocoetidae	<i>Parexocoetus mento</i>	37		72
Hemiramphidae	201	115.1	Hemiramphidae	<i>Euleptorhamphus viridis</i>	37		72
Hemiramphidae	201	115.2	Hemiramphidae	<i>Hemiramphus far</i>	37	1	73
Hemiramphidae	201	115.3	Hemiramphidae	<i>Hyporhamphus affinis</i>	37		73
Hemiramphidae	201	115.4	Hemiramphidae	<i>Hyporhamphus capensis</i>	37	1	73
Hemiramphidae	201	115.6	Hemiramphidae	<i>Oxyporhamphus m. micropterus</i>	38		73
Belonidae	202	113.1	Belonidae	<i>Ablennes hians</i>	38		74
Belonidae	202	113.2	Belonidae	<i>Petalichthys capensis</i>	38		74



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Scomberesocidae	203	114.2	Scomberesocidae	<i>Scomberesox saurus scomberoides</i>	38	1	74
ORDER: ATHERINIFORMES							
Antherinidae	213	111.1	Antherinidae	<i>Atherina breviceps</i>	39	1	74
Antherinidae	213	111.3	Antherinidae	<i>Atherinomorus lacunosus</i>	39		75
Antherinidae	213	111.6	Antherinidae	<i>Hypoatherina temminckii</i>	39		75
ORDER: LAMPRIFORMES							
Lophotidae	220	121.2	Lophotidae	<i>Lophotus lacepede</i>	39		75
Trachipteridae	222	119.3	Trachipteridae	<i>Trachipterus trachipterus</i>	39		75
Regalecidae	223	122.1	Regalecidae	<i>Agrostichthys parkeri</i>	39		76
Ateleopodidae	225	124.2	Ateleopodidae	<i>Ateleopus natalensis</i>	40		76
ORDER: BERYCIFORMES							
Monocentridae	229	128.1	Monocentridae	<i>Monocentris japonicus</i>	40		76
Trachichthyidae	230	127.2	Trachichthyidae	<i>Hoplostethus atlanticus</i>	40	1	76
Trachichthyidae	230	127.4	Trachichthyidae	<i>Hoplostethus mediterraneus</i>	40	1	77
Trachichthyidae	230	127.6	Trachichthyidae	<i>Hoplostethus melanopus</i>	40		77
Anomalopidae	231	129.1	Anomalopidae	<i>Photoblepharon palpebratus steinitzi</i>	41		77
Diretmidae	232	130.1	Diretmidae	<i>Diretmoides parini</i>	41		77
Diretmidae	232	130.2	Diretmidae	<i>Diretmus argenteus</i>	41	1	77
Anoplogasteridae	233	131.1	Anoplogasteridae	<i>Anoplogaster cornuta</i>	41		78
Berycidae	234	126.2	Berycidae	<i>Beryx splendens</i>	41	1	78
Berycidae	234	126.3	Berycidae	<i>Centroberyx spinosus</i>	42		78
Holocentridae	235	132.4	Holocentridae	<i>Neoniphon sammara</i>	42		79
Holocentridae	235	132.5	Holocentridae	<i>Sargocentron caudimaculatum</i>	42		79
Holocentridae	235	132.6	Holocentridae	<i>Sargocentron diadema</i>	42		79
Holocentridae	235	132.7	Holocentridae	<i>Sargocentron inaequalis</i>	42		80
Holocentridae	235	132.10	Holocentridae	<i>Sargocentron melanospilos</i>	42		80
Holocentridae	235	132.12	Holocentridae	<i>Sargocentron praslin</i>	42		80
Holocentridae	235	132.13	Holocentridae	<i>Sargocentron punctatissimum</i>	42		80
Holocentridae	235	132.16	Holocentridae	<i>Sargocentron spiniferum</i>	43		80
Holocentridae	235	132.21	Holocentridae	<i>Myripristis berndti</i>	43		80
Holocentridae	235	132.22	Holocentridae	<i>Myripristis chryseres</i>	43		81
Holocentridae	235	132.23	Holocentridae	<i>Myripristis hexagona</i>	43		81
Holocentridae	235	132.24	Holocentridae	<i>Myripristis kuntee</i>	43		81
Holocentridae	235	132.25	Holocentridae	<i>Myripristis melanosticta</i>	43		81
Holocentridae	235	132.26	Holocentridae	<i>Myripristis murdjan</i>	43		81
Holocentridae	235	132.27	Holocentridae	<i>Myripristis pralinia</i>	43		82
Holocentridae	235	132.33	Holocentridae	<i>Ostichthys kaianus</i>	44		82
Holocentridae	235	132.34	Holocentridae	<i>Plectrypops lima</i>	44		82
Polymixiidae	236	134.1	Polymixiidae	<i>Polymixia berndti</i>	44		82
Melamphaidae	238	133.5	Melamphaidae	<i>Melamphaes simus</i>	44		83
Melamphaidae	238	133.6	Melamphaidae	<i>Poromitra crassiceps</i>	44		83
Melamphaidae	238	133.7	Melamphaidae	<i>Poromitra megalops</i>	44		83
Melamphaidae	238	133.12	Melamphaidae	<i>Scopelogadus beanii</i>	44		83
Melamphaidae	238	133.13	Melamphaidae	<i>Scopelogadus mizolepis mizolepis</i>	44		83
Melamphaidae	238	133.14	Melamphaidae	<i>Sio nordskjoldii</i>	44		83
Rondeletidae	240	136.1	Rondeletidae	<i>Rondeletia loricata</i>	45		84
Barbourisiidae	241	137.1	Barbourisiidae	<i>Barbourisia rufa</i>	45		84
ORDER: ZEIFORMES							
Macrourocyttidae	244	141.1	Zeniontidae	<i>Zenion hololepis</i>	45		84
Zeidae	245	138.2	Zeidae	<i>Cyttus traversi</i>	45		85
Zeidae	245	138.3	Zeidae	<i>Zenopsis conchifer</i>	45		85
Zeidae	245	138.4	Zeidae	<i>Zeus capensis</i>	45	1	85
Zeidae	245	138.5	Zeidae	<i>Zeus faber</i>	45		85
Oreosomatidae	246	139.2	Oreosomatidae	<i>Allocyttus verrucosus</i>	46	1	85
Oreosomatidae	246	139.3	Oreosomatidae	<i>Neocyttus rhomboidalis</i>	46	1	86
Oreosomatidae	246	139.4	Oreosomatidae	<i>Oreosoma atlanticum</i>	46	1	86
Oreosomatidae	246	139.5	Oreosomatidae	<i>Pseudocyttus maculatus</i>	46		86
Grammicolepididae	247	140.2	Grammicolepididae	<i>Xenolepidichthys dalgleishi</i>	46		86
Caproidae	248	162.1	Caproidae	<i>Antigonia rubescens</i>	47		86
ORDER: PEGASIFORMES							
Pegasidae	253	142.1	Pegasidae	<i>Eurypegasis draconis</i>	47		87
ORDER: SYNGNATHIFORMES							
Aulostomidae	254	143.1	Aulostomidae	<i>Aulostomus chinensis</i>	47		87
Fistulariidae	255	144.1	Fistulariidae	<i>Fistularia commersonii</i>	47		87
Macroramphosidae	256	147.2	Macroramphosidae	<i>Macroramphosus scolopax</i>	47	1	87
Macroramphosidae	256	147.4	Macroramphosidae	<i>Notopogon macrosolen</i>	47		87
Syngnathidae	259	145.31	Syngnathidae	<i>Trachyrhamphus bicoarctatus</i>	48		88
ORDER: DACTYLOPTERIFORMES							
Dactylopteridae	260	159.1	Dactylopteridae	<i>Dactyloptena orientalis</i>	48		88
Dactylopteridae	260	159.2	Dactylopteridae	<i>Dactyloptena peterseni</i>	48		88
ORDER: SCORPAENIFORMES							
Scorpaenidae	262	149.1	Scorpaenidae	<i>Apistus carinatus</i>	48		89
Scorpaenidae	262	149.3	Scorpaenidae	<i>Minous coccineus</i>	48		89

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Scorpaenidae	262	149.7	Scorpaenidae	<i>Pterois antennata</i>	49		90
Scorpaenidae	262	149.8	Scorpaenidae	<i>Pterois miles</i>	49		90
Scorpaenidae	262	149.10	Scorpaenidae	<i>Pterois radiata</i>	49		90
Scorpaenidae	262	149.14	Scorpaenidae	<i>Neomerinthe nielseni</i>	49		91
Scorpaenidae	262	149.17	Scorpaenidae	<i>Phenacoscorpius adenensis</i>	49		91
Scorpaenidae	262	149.21	Scorpaenidae	<i>Scorpaena scrofa</i>	49	1	91
Scorpaenidae	262	149.28	Scorpaenidae	<i>Scorpaenodes parvipinnis</i>	50		91
Scorpaenidae	262	149.32	Scorpaenidae	<i>Scorpaenopsis gibbosa</i>	50		91
Scorpaenidae	262	149.36	Scorpaenidae	<i>Scorpaenopsis venosa</i>	50		91
Scorpaenidae	262	149.37	Scorpaenidae	<i>Sebastapistes cyanostigma</i>	50		92
Scorpaenidae	262	149.39	Scorpaenidae	<i>Sebastapistes strongia</i>	50		92
Scorpaenidae	262	149.41	Scorpaenidae	<i>Taenianotus triacanthus</i>	50		92
Scorpaenidae	262	149.42	Scorpaenidae	<i>Helicolenus dactylopterus</i>	50	1	92
Scorpaenidae	262	149.43	Scorpaenidae	<i>Sebastes capensis</i>	50		92
Scorpaenidae	262	149.44	Scorpaenidae	<i>Trachyscorpia capensis</i>	51	1	93
Scorpaenidae	262	149.45	Scorpaenidae	<i>Setarches guentheri</i>	51		93
Scorpaenidae	262	149.46	Scorpaenidae	<i>Synanceia verrucosa</i>	51		93
Scorpaenidae	262	150.2	Tetrarogidae	<i>Coccotropsis gymnoderma</i>	51	1	93
Congiopodidae	267	152.1	Congiopodidae	<i>Congiopodus spinifer</i>	51	1	93
Congiopodidae	267	152.2	Congiopodidae	<i>Congiopodus torvus</i>	52		94
Triglidae	268	157.1	Triglidae	<i>Chelidonichthys capensis</i>	52	1	94
Triglidae	268	157.2	Triglidae	<i>Chelidonichthys kumu</i>	52	1	94
Triglidae	268	157.3	Triglidae	<i>Chelidonichthys queketti</i>	52	1	95
Triglidae	268	157.4	Triglidae	<i>Lepidotrigla faurei</i>	52		95
Triglidae	268	157.5	Triglidae	<i>Lepidotrigla multispinosa</i>	52		95
Triglidae	268	157.6	Triglidae	<i>Trigla lyra</i>	53		95
Triglidae	268	157.7	Triglidae	<i>Trigloporus lastoviza africanus</i>	53		95
Triglidae	268	158.1	Peristediidae	<i>Peristedion weberi</i>	53	1	96
Triglidae	268	158.2	Peristediidae	<i>Satyrichthys adeni</i>	53	1	96
Triglidae	268	158.3	Peristediidae	<i>Satyrichthys investigatoris</i>	53		96
Platycephalidae	269	154.1	Bembridge	<i>Parabembras robinsoni</i>	54		96
Platycephalidae	269	155.1	Platycephalidae	<i>Cociella crocodila</i>	54		97
Platycephalidae	269	155.2	Platycephalidae	<i>Cociella sp.</i>	54		97
Platycephalidae	269	155.3	Platycephalidae	<i>Grammoplites portuguesus</i>	54		97
Platycephalidae	269	155.6	Platycephalidae	<i>Platycephalus indicus</i>	54		97
Platycephalidae	269	155.7	Platycephalidae	<i>Sorsogona prionota</i>	54		97
Platycephalidae	269	155.8	Platycephalidae	<i>Thysanophrys arenicola</i>	54		98
Hoplichthyidae	270	156.1	Hoplichthyidae	<i>Hoplichthys acanthopleurus</i>	55		98
Psychrolutidae	279	160.2	Psychrolutidae	<i>Ebinania costaeacanae</i>	55		98
Psychrolutidae	279	160.3	Psychrolutidae	<i>Psychrolutes inermis</i>	55		98
Psychrolutidae	279	160.4	Psychrolutidae	<i>Psychrolutes macrocephalus</i>	55	1	98
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Centropomidae	282	163.1	Ambassidae	<i>Ambassis gymnocephalus</i>	55		99
Centropomidae	282	163.2	Ambassidae	<i>Ambassis natalensis</i>	55		99
Centropomidae	282	163.3	Ambassidae	<i>Ambassis productus</i>	55		99
Percichthyidae	283	165.1	Polyprionidae	<i>Polyprion americanus</i>	56		99
Percichthyidae	283	176.1	Acropomatidae	<i>Acropoma japonicum</i>	56		100
Percichthyidae	283	176.2	Acropomatidae	<i>Howella sherborni</i>	56		100
Percichthyidae	283	176.3	Acropomatidae	<i>Neoscombrops annectens</i>	56	1	100
Percichthyidae	283	176.5	Acropomatidae	<i>Synagrops japonicus</i>	56	1	100
Percichthyidae	283	176.6	Acropomatidae	<i>Synagrops microlepis</i>	56		101
Serranidae	284	166.1	Serranidae	<i>Acanthistius sebastoides</i>	57	1	101
Serranidae	284	166.2	Serranidae	<i>Acanthistius sp.</i>	57		101
Serranidae	284	166.4	Serranidae	<i>Anthias connelli</i>	57		101
Serranidae	284	166.9	Serranidae	<i>Anthias squamipinnis</i>	57	1	102
Serranidae	284	166.12	Serranidae	<i>Holanthias natalensis</i>	57		102
Serranidae	284	166.15	Serranidae	<i>Nemanthias carberryi</i>	57		102
Serranidae	284	166.19	Serranidae	<i>Aethaloperca rogoa</i>	58		102
Serranidae	284	166.21	Serranidae	<i>Cephalopholis argus</i>	58		102
Serranidae	284	166.22	Serranidae	<i>Cephalopholis aurantia</i>	58		103
Serranidae	284	166.25	Serranidae	<i>Cephalopholis leopardus</i>	58		103
Serranidae	284	166.26	Serranidae	<i>Cephalopholis miniata</i>	58		103
Serranidae	284	166.27	Serranidae	<i>Cephalopholis nigripinnis</i>	58		103
Serranidae	284	166.28	Serranidae	<i>Cephalopholis sexmaculata</i>	58		103
Serranidae	284	166.29	Serranidae	<i>Cephalopholis sonnerati</i>	59	1	103
Serranidae	284	166.30	Serranidae	<i>Cephalopholis spiloparaea</i>	59		104
Serranidae	284	166.-	Serranidae	<i>Cephalopholis urodata</i>	59		104
Serranidae	284	166.31	Serranidae	<i>Cromileptes altivelis</i>	59		104
Serranidae	284	166.33	Serranidae	<i>Epinephelus albomarginatus</i>	59		104
Serranidae	284	166.34	Serranidae	<i>Epinephelus andersoni</i>	59	1	104
Serranidae	284	166.37	Serranidae	<i>Epinephelus chabaudi</i>	60		105



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Serranidae	284	166.39	Serranidae	<i>Epinephelus fasciatus</i>	60	1	105
Serranidae	284	166.41	Serranidae	<i>Epinephelus flavocaeruleus</i>	60		105
Serranidae	284	166.44	Serranidae	<i>Epinephelus hexagonatus</i>	60		105
Serranidae	284	166.45	Serranidae	<i>Epinephelus lanceolatus</i>	61		106
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Serranidae	284	166.40	Serranidae	<i>Epinephelus macrospilos</i>	61		106
Serranidae	284	166.43	Serranidae	<i>Epinephelus marginatus</i>	61	1	106
Serranidae	284	166.49	Serranidae	<i>Epinephelus melanostigma</i>	61		106
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Priacanthidae	296	174.2	Priacanthidae	<i>Priacanthus cruentatus</i>	65	1	112
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Carangidae	306	210.22	Carangidae	<i>Caranx sexfasciatus</i>	71		123
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Lutjanidae	316	181.10	Lutjanidae	<i>Lutjanus gibbus</i>	78		132
Lutjanidae	316	181.11	Lutjanidae	<i>Lutjanus kasmira</i>	78	1	132
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Lutjanidae	316	181.16	Lutjanidae	<i>Lutjanus rivulatus</i>	78		133
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Haemulidae	320	179.4	Haemulidae	<i>Plectorhinchus gaterinus</i>	81		138
Haemulidae	320	179.5	Haemulidae	<i>Plectorhinchus gibbosus</i>	82		138
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Haemulidae	320	179.10	Haemulidae	<i>Pomadasys commersonii</i>	82	1	139
Haemulidae	320	179.11	Haemulidae	<i>Pomadasys furcatum</i>	82		139
Haemulidae	320	179.13	Haemulidae	<i>Pomadasys kaakan</i>	82		139
Haemulidae	320	179.15	Haemulidae	<i>Pomadasys maculatum</i>	82		139
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Haemulidae	320	179.17	Haemulidae	<i>Pomadasys olivaceum</i>	83	1	140
Haemulidae	320	179.18	Haemulidae	<i>Pomadasys striatum</i>	83	1	140
Haemulidae	320	179.19	Haemulidae	<i>Pomadasys stridens</i>	83		140
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Sparidae	322	183.2	Sparidae	<i>Acanthopagrus bifasciatus</i>	83		142
Sparidae	322	183.3	Sparidae	<i>Argyrops filamentosus</i>	84		142
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Sparidae	322	183.6	Sparidae	<i>Boopsoidea inornata</i>	84	1	143
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Sparidae	322	183.9	Sparidae	<i>Chrysoblephus cristiceps</i>	85	1	144
Sparidae	322	183.10	Sparidae	<i>Chrysoblephus gibbiceps</i>	85	1	144
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Sparidae	322	183.14	Sparidae	<i>Crenidens crenidens</i>	86		145
Sparidae	322	183.15	Sparidae	<i>Cymatoceps nasutus</i>	86	1	145
Sparidae	322	183.16	Sparidae	<i>Diplodus cervinus hottentotus</i>	86	1	145
Sparidae	322	183.17	Sparidae	<i>Diplodus sargus capensis</i>	86	1	145
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Sparidae	322	183.20	Sparidae	<i>Lithognathus lithognathus</i>	87	1	146
Sparidae	322	183.21	Sparidae	<i>Lithognathus mormyrus</i>	87	1	146
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Sparidae	322	183.23	Sparidae	<i>Pachymetopon blochii</i>	88		147
Sparidae	322	183.24	Sparidae	<i>Pachymetopon grande</i>	88	1	147
Sparidae	322	183.25	Sparidae	<i>Pagellus bellottii natalensis</i>	88	1	147
Sparidae	322	183.26	Sparidae	<i>Petrus rupestris</i>	88	1	147
Sparidae	322	183.27	Sparidae	<i>Polyamblyodon germanum</i>	89		147
Sparidae	322	183.28	Sparidae	<i>Polyamblyodon gibbosum</i>	89		148
Sparidae	322	183.29	Sparidae	<i>Polysteganus coeruleopunctatus</i>	89		148
Sparidae	322	183.31	Sparidae	<i>Polysteganus praeorbitalis</i>	89	1	148
Sparidae	322	183.32	Sparidae	<i>Polysteganus undulosus</i>	90	1	148
Sparidae	322	183.33	Sparidae	<i>Porcostoma dentata</i>	90	1	148
Sparidae	322	183.34	Sparidae	<i>Pterogymnus laniarius</i>	90	1	149
Sparidae	322	183.35	Sparidae	<i>Rhabdosargus globiceps</i>	90	1	149
Sparidae	322	183.36	Sparidae	<i>Rhabdosargus holubi</i>	90	1	149
Sparidae	322	183.37	Sparidae	<i>Rhabdosargus sarba</i>	90	1	149
Sparidae	322	183.38	Sparidae	<i>Rhabdosargus thorpei</i>	91		149
Sparidae	322	183.39	Sparidae	<i>Sarpa salpa</i>	91	1	150
Sparidae	322	183.40	Sparidae	<i>Sparodon durbanensis</i>	91	1	150
Sparidae	322	183.41	Sparidae	<i>Spondylisoma emarginatum</i>	91	1	150
Centracanthidae	323	184.1	Centracanthidae	<i>Spicara australis</i>	91		150
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Lethrinidae	324	185.2	Lethrinidae	<i>Gymnocranius griseus</i>	92	1	152
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Lethrinidae	324	185.5	Lethrinidae	<i>Lethrinus croceus</i>	92		152
Lethrinidae	324	185.6	Lethrinidae	<i>Lethrinus elongatus</i>	92	1	152
Lethrinidae	324	185.11	Lethrinidae	<i>Lethrinus mahsena</i>	92		152
Lethrinidae	324	185.12	Lethrinidae	<i>Lethrinus mahsenoides</i>	92	1	153
Lethrinidae	324	185.13	Lethrinidae	<i>Lethrinus nebulosus</i>	93	1	153
Lethrinidae	324	185.15	Lethrinidae	<i>Lethrinus rubrioperculatus</i>	93		153
Lethrinidae	324	185.16	Lethrinidae	<i>Lethrinus sanguineus</i>	93		153
Lethrinidae	324	185.17	Lethrinidae	<i>Lethrinus variegatus</i>	93		153
Lethrinidae	324	185.19	Lethrinidae	<i>Monotaxis grandoculis</i>	93		154
Nemipteridae	325	186.1	Nemipteridae	<i>Nemipterus bipunctatus</i>	93		154
Nemipteridae	325	186.3	Nemipteridae	<i>Parasclopsis eriomma</i>	93		154
Nemipteridae	325	186.6	Nemipteridae	<i>Scolopsis vosmeri</i>	93		154
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Sciaenidae	326	199.3	Sciaenidae	<i>Atractoscion aequidens</i>	94	1	156
Sciaenidae	326	199.4	Sciaenidae	<i>Atrobucca nibe</i>	94	1	156
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Sciaenidae	326	199.8	Sciaenidae	<i>Umbrina canariensis</i>	95	1	157
Sciaenidae	326	199.9	Sciaenidae	<i>Umbrina ronchus</i>	95		157
Mullidae	327	196.1	Mullidae	<i>Mulloides flavolineatus</i>	96		157
Mullidae	327	196.3	Mullidae	<i>Parupeneus barberinus</i>	96		158
Mullidae	327	196.4	Mullidae	<i>Parupeneus bifasciatus</i>	96		158
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Gobiidae	403	240.20	Gobiidae	<i>Caffrogobius caffer</i>	128		206
Gobiidae	403	240.21	Gobiidae	<i>Caffrogobius multifasciatus</i>	128		206
Gobiidae	403	240.23	Gobiidae	<i>Caffrogobius nudiceps</i>	128	1	206
Gobiidae	403	240.24	Gobiidae	<i>Caffrogobius saldanha</i>	128	1	206
Gobiidae	403	240.43	Gobiidae	<i>Glossogobius callidus</i>	129		206
Gobiidae	403	240.47	Gobiidae	<i>Gobiodon citrinus</i>	129		207
Gobiidae	403	240.56	Gobiidae	<i>Istigobius decoratus</i>	129		207
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Gobiidae	403	240.64	Gobiidae	<i>Nemateleotris magnifica</i>	129		207
Gobiidae	403	240.71	Gobiidae	<i>Oxyurichthys papuensis</i>	129		207
Gobiidae	403	240.73	Gobiidae	<i>Parachaeturichthys polymema</i>	129		208
Gobiidae	403	240.84	Gobiidae	<i>Priolepis cincta</i>	129		208
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Gobiidae	403	240.97	Gobiidae	<i>Sufflogobius bibarbatus</i>	129	1	208
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Acanthuridae	409	243.1	Acanthuridae	<i>Acanthurus blochii</i>	130		209
Acanthuridae	409	243.2	Acanthuridae	<i>Acanthurus dussumieri</i>	130		209
Acanthuridae	409	243.3	Acanthuridae	<i>Acanthurus leucosternon</i>	130		209
Acanthuridae	409	243.4	Acanthuridae	<i>Acanthurus lineatus</i>	130		209
Acanthuridae	409	243.7	Acanthuridae	<i>Acanthurus nigrofuscus</i>	130		210
Acanthuridae	409	243.9	Acanthuridae	<i>Acanthurus tennenti</i>	130		210
Acanthuridae	409	243.11	Acanthuridae	<i>Acanthurus triostegus</i>	131		210
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Acanthuridae	409	243.14	Acanthuridae	<i>Ctenochaetus striatus</i>	131		210
Acanthuridae	409	243.15	Acanthuridae	<i>Ctenochaetus strigosus</i>	131		210
Acanthuridae	409	243.16	Acanthuridae	<i>Paracanthurus hepatus</i>	131		211
Acanthuridae	409	243.17	Acanthuridae	<i>Zebrasoma gemmatum</i>	131		211
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Siganidae	410	245.2	Siganidae	<i>Siganus sutor</i>	132		213
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Gempylidae	412	247.-	Gempylidae	<i>Promethichthys prometheus</i>	133		214
Gempylidae	412	247.6	Gempylidae	<i>Rexea promethoides</i>	133		214
Gempylidae	412	247.8	Gempylidae	<i>Thyrsites atun</i>	133	1	214
Gempylidae	412	247.9	Gempylidae	<i>Thyrsitoides marleyi</i>	133		214
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Trichiuridae	413	248.4	Trichiuridae	<i>Lepidopus caudatus</i>	134	1	215
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Scombridae	414	249.9	Scombridae	<i>Sarda orientalis</i>	135		217
Scombridae	414	249.10	Scombridae	<i>Sarda sarda</i>	135		217
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Nomeidae	420	255.4	Nomeidae	<i>Cubiceps caeruleus</i>	137	1	220
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# OTOLITH ATLAS OF SOUTHERN AFRICAN MARINE FISHES

by

Malcolm J. Smale<sup>1</sup>, Gillian Watson<sup>1</sup>, Thomas Hecht<sup>2</sup>

## INTRODUCTION

Otoliths have long been recognised as anatomical structures that are species specific and therefore useful to identify fishes in paleoichthyology (Fitch, 1967; Nolf, 1985) and in studies of trophic relations of predators (Fitch & Brownell, 1968; Ross, 1984). Systematic collection of otoliths and their use in prey identification began in the 1960s (Fitch & Brownell, 1968; Pinkas, Oliphant & Iverson, 1971; Ross, 1984; Fitch & Craig, 1984). Their use in feeding studies has considerably advanced understanding of marine food webs, particularly at upper trophic levels (Batchelor & Ross, 1984; Smale & Bruton, 1985; Smale, 1986a,b, 1987; Klages, Willis & Ross, 1992; Sekiguchi, Klages & Best, 1992). The present work is the culmination of some 20 years of otolith collection in southern Africa.

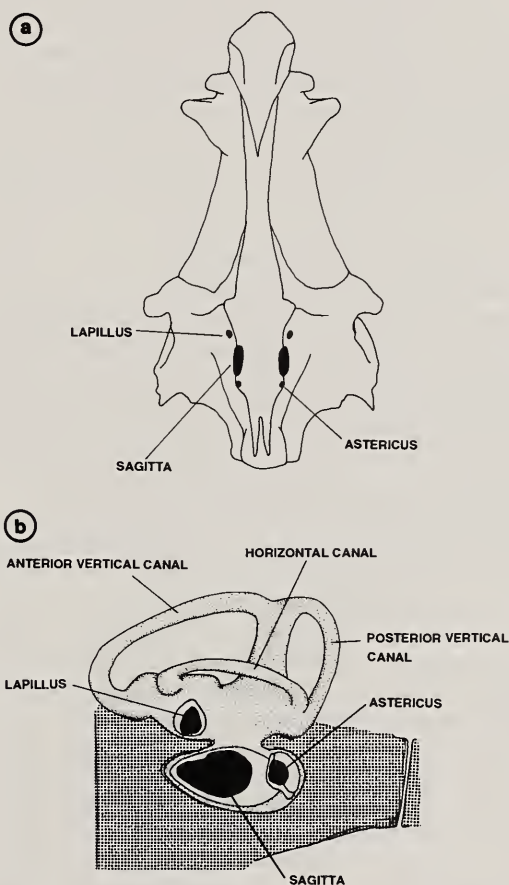
Although previous atlases have been published on otoliths (Morrow, 1979; Hecht, 1987; Härkönen, 1986; Williams & McEldowney, 1990), this is the first atlas for the marine fishes of southern Africa. A total of 972 species representing about 181 families are described and illustrated.

This atlas is intended primarily as a reference aid to researchers attempting to identify teleost otoliths from the gut contents of piscivorous predators, fish remains in archaeological middens, or otoliths from other sources off southern Africa. The fish fauna of this region is extremely diverse with more than 2150 species in approximately 270 families (Smith & Heemstra, 1986). Furthermore, new taxa are being discovered every year as research continues and poorly sampled areas are investigated in more detail. Smith & Heemstra (1986) provide a description of the area and a brief summary of the oceanography. The southern African fish fauna comprises species from the Indian, Atlantic and Southern Oceans and includes tropical, subtropical and temperate fishes from the estuarine, intertidal, continental shelf, slope, abyssal and pelagic zones.

Although this atlas of fish otoliths is not primarily intended to be a contribution to the systematics of teleosts, it is hoped that the differences within families and similarities between families will encourage systematists to reconsider systematic groupings that appear to be poorly supported by the features found in otoliths. This atlas points out some apparent inconsistencies in taxonomic groupings, but it is recognised that otoliths alone cannot be used to define taxonomic affinities. Nevertheless, it has been noted that they can suggest potentially fruitful research areas for revision of systematic relationships using a wider suite of characters (Nolf, 1993). It was beyond the scope of the

present work to discuss or analyse these differences in any detail, although comments on groupings may be found in the text.

Nolf (1993) correctly points out that functional morphology has a profound influence on otolith shape, illustrating striking similarities in the otoliths of the scombrid *Acanthocybium solandri*, and the unrelated fresh water centrropomid *Lucioides stappersi*. Despite this caveat, we believe that the study of otoliths has a valuable role in taxonomic studies. Indeed, the wider interest in otolith studies provides some interesting insights in to relative influences of phylogeny and functional morphology (Gaemers, 1976; Schwarzhans, 1978; Nolf, 1979), and we hope that this atlas will contribute to such investigations.



**Figure 1.** a) Diagram of the skull of *Dinoperca petersi* (after Heemstra & Hecht, 1986) illustrating the position of the otoliths. b) Diagram of the semicircular canals, otoliths and descriptive terms (after Nolf, 1985).

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## Otolith function and structure

The auditory-equilibrium organ or "labyrinth" of fishes comprises three fluid-filled semicircular canals that are connected with three sac-like chambers, the sacculus, utriculus and lagena (Hildebrand, 1974). Each chamber contains a hard bone-like otolith (ear-stone): the sagitta, lapillus and asteriscus, respectively (Fig. 1).

The labyrinths are located in the bony auditory capsules at the back of the cranium. In most teleosts the sacculus is the largest of the three chambers, hence the sagitta is usually the largest of the three otoliths. The lapillus and asteriscus are generally much smaller and rarely found in stomach contents or in middens. In some fishes (e.g., the Cypriniformes and Siluriformes), the utriculus is the largest chamber, and the lapillus is then the largest otolith. Members of the siluriform family Ariidae have a massive lapillus, whilst the sagitta and asteriscus are minute. The configuration of the sagitta is usually more complicated than that of the other two otoliths, and it shows more characteristic features that can be used to distinguish various species, genera and families.

The utriculus seems to be more important in maintaining equilibrium of the fish, and the sacculus and lagena appear to be more concerned with sound reception. Each chamber has sensory cells in contact with the otolith, consequently all of the chambers are sensitive to gravity, acceleration and vibration.

The various names that have been used for the three otoliths are as follows:

saccular otolith = sagitta = sacculith

utricular otolith = lapillus = utriculith

lagenar otolith = asteriscus = lagenalith

Several physiological functions have been ascribed to the otolith: 1. maintenance and regulation of muscle tone; 2. perception of angular accelerations; 3. perception of gravity; 4. perception of sound (Lowenstein, 1957). In addition, the discovery of strong piezoelectric qualities of otoliths has led some authors to suggest that they may be of some use in frequency analysis, depth perception, or both (Morris & Kittleman, 1967; Nolf, 1985). Functional requirements appear to have a marked influence on the shape and appearance of the otolith, and this may result in similarities of otolith shape for unrelated species (Nolf, 1993).

Otoliths are initially formed of protein granules which merge, forming a sub-primordium; this is then covered by a layer of calcium and a layer of protein. Large amounts of protein are accreted around this, forming the primordium (Zhang & Runham, 1989). Otoliths have been used to assess growth because the character of the complex matrix of protein and aragonite crystals varies both on a daily and seasonal basis (Panella, 1974; Blacker, 1974; Morales-Nin, 1987). Although the growth occurs on the outer margin of the otolith in approximately concentric zones, the margin may grow differentially with notches or erosion of some surfaces, which causes variation in the macroscopic appearance of the otolith with growth. Often the otoliths grow more in length than in other planes; consequently, they often appear relatively more elongate in adults than in juveniles of the same species. Ontogenetic changes in shape occur between larvae, juveniles and adult fish. Generally, adults have more distinctive otoliths compared to small juveniles,

which are more similar, at least within a family, and sometimes between families.

## MATERIALS AND METHODS

When possible, fish identifications were confirmed by appropriate taxonomists and voucher specimens were usually lodged in the J.L.B Smith Institute of Ichthyology or South African Museum. Where available, both the otolith collection number and the number of the institution at which the voucher is held is given in the text. Identifiers of fishes are cited in the text for material used in the atlas. In some instances the fish specimens held in other museums had not yet been accessioned at the time of going to print, in which case the term "lodged in" with the museum name is given. The importance of having at least one voucher specimen in a museum collection cannot be over-emphasized. On numerous occasions this precaution resolved problems when new species were discovered (e.g. Macrouridae) or when new distribution records were recognised. Conversely, otoliths have occasionally alerted us to problems in specimens that appeared to belong to a single species (e.g. *Epigonus* cf. *robustus*, *Chascanopsetta* cf. *lugubris*). Unresolved taxonomic problems are noted in the text.

The fishes were measured to the nearest mm usually using total, fork and standard length and weighed to the nearest gram. The otolith measurement generally used was otolith diameter, the greatest diameter of the otolith. This is the same as the otolith length in most species except in those with unusual shapes, such as tall, when otolith height is greater than otolith length.

The otoliths were usually removed in one of two ways. The quickest method is to cut through the isthmus and remove the gills, turn the fish upside down, then, with the head forced down, break it from the spinal column. A pair of bone cutters or heavy duty scissors are positioned so that a blade is on each side of the occipital condyle and the floor of the skull is lifted. The scissors or bone cutters may be closed a fraction to initiate the plane of fracture. If they are closed more than this, the otoliths are destroyed. If this technique is carried out correctly, the otoliths lie exposed inside the otic capsules when the basioccipital is lifted away. If the fish is needed as a voucher, a different method of removal is recommended. The fish should be placed on its side, the gill cover lifted and the gills carefully pulled down and cut away from the skull. This area is well supplied with blood vessels and it will be necessary to dry the blood with absorbent paper before proceeding. The skull should be exposed and the otic capsules should be visible (the otolith may also be visible in some species). The otic capsule is then opened with the tip of a scalpel or sharp knife. Inward pressure should be avoided because this bone often breaks easily and the otolith is readily broken if the dissecting instrument is forced inwards. The hole in the skull should be widened to allow the otolith to be removed without damaging it. The fish may then be turned over and the process repeated to remove the other otolith. The dissection is facilitated in small species by use of a dissecting microscope. Alternatively, a jeweller's magnifying glass may be used. In groups such as flatfishes and boxfishes, removal may best be attempted by the method described and illustrated by Williams & Bedford (1974).



After extraction, the otoliths were washed thoroughly to remove otic fluid, blood and tissue and allowed to air dry. They were labeled and stored in small vials or gelatin capsules. To date, gelatin capsules have been found to be the best small containers, but they have the disadvantage of being soluble and degradable by insects. When working with gelatin capsules, the environment and hands must be kept dry. Otoliths should never be stored in formalin solution as this corrodes the surface, making them chalky. Similarly, the fish from which otoliths are to be removed should not be formalinised. Alcohol should also be avoided, as this too may damage otoliths. To preserve fishes, freezing prior to otolith removal is ideal; but, if they are not maintained at a low enough temperature, putrefaction obvious in the tissues of the fish, also occurs in the otolith, presumably as a result of denaturing of the protein matrix of the otolith by bacterial activity.

#### **Preparation of material for the SEM**

Otoliths were mounted onto a brass stub 50 mm in diameter and 4 mm thick. The stub was divided into 8 segments and each segment numbered to allow the position of individual otoliths to be mapped and recorded. A centre punch hole allowed for more accurate location of otoliths whilst photographing in the electron microscope. Numbering segments and the use of an illustrated map considerably facilitated orientation in this process.

The glue used to affix the otoliths to the stub was obtained by dissolving the adhesive off double sided "Sello-tape" in chloroform. Usually six 20 mm strips were dissolved in c. 10 ml of chloroform for the glue solution. This solution was spread in a thin film over the stub using a dropper. After a few minutes it became tacky and was ready for the otoliths to be mounted. Each otolith was gently pressed into the glue and staightened to allow it to be positioned as required. Convex or very concave otoliths were supported with tissue paper to ensure they remained upright. Mounting onto stubs was done no more than a few days in advance as they tend to collect dust and move if the glue dries out.

Mounted otoliths were sputter-coated with a thin layer of gold (20 nm) using a standard coating time of two minutes. Preliminary attempts to photograph without gold coating yielded poor results.

Scanning electron micrographs were done at the Electron Microscopy Unit of Rhodes University using a JOEL scanning electron microscope. Otoliths smaller than 12 mm long and 5 mm wide yielded the best photographic results. The largest otolith that could be photographed on a single negative was about 10 mm long. Larger otoliths had to be photographed using multiple overlapping photographs. Very large otoliths (>15 mm OD) had to be placed on the grid at the bottom of the microscope once the stage had been removed. This proved a limitation as it had to be carefully centred on the grid and magnification variation is limited. Furthermore, the machine has to be evacuated for each otolith, slowing down the process considerably.

After photography, otoliths were removed from the stubs within a few days. A drop of chloroform was put next to each otolith to dissolve the glue; this reduced the risk of damage to the fragile specimens. Each otolith was removed

with forceps and briefly placed in a shallow bath of chloroform to remove all traces of the glue. After careful drying on tissue paper, it was then replaced in its capsule. The gold was not removed, as features of these coated otoliths are easier to see under binocular microscopes than those of uncoated specimens.

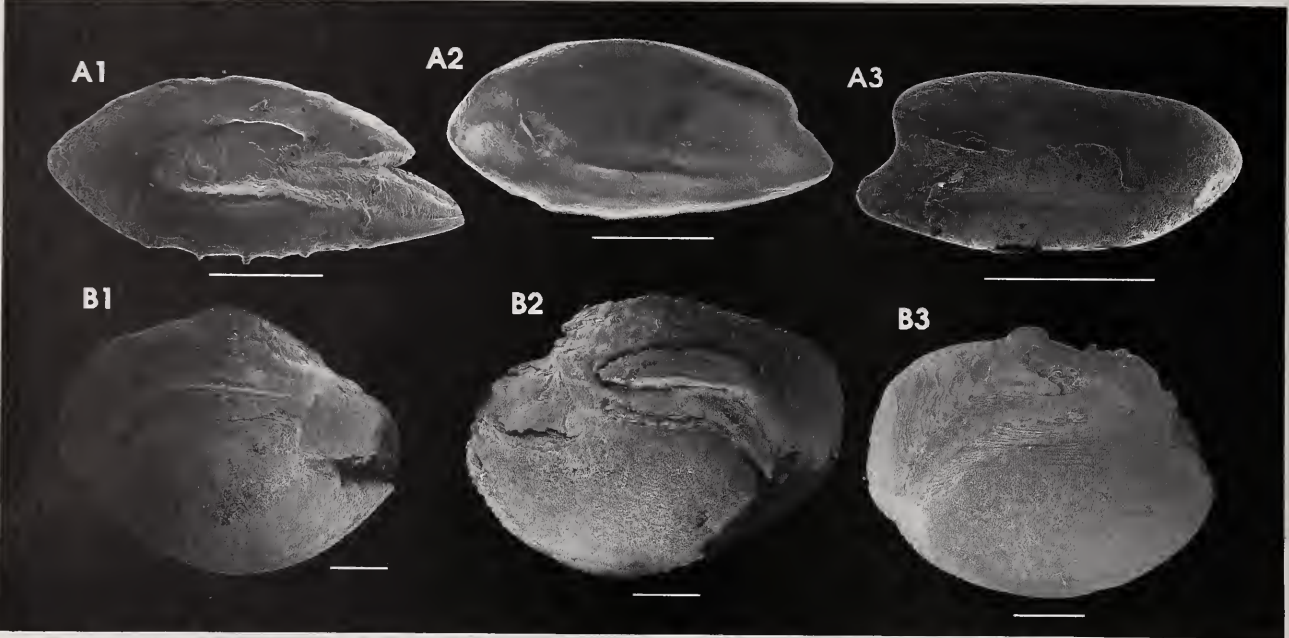
#### **Use of the otolith reference collection**

Large otoliths (>20 mm) may be numbered directly on the lateral surface. However, the otoliths of many species of fish are too small to be numbered directly, consequently they are placed in numbered gelatin capsules, which ideally should be transparent. In cases where the otoliths themselves are not numbered, there is a danger of mixing them up when more than one pair is removed from their capsules. Several precautions are used to reduce this risk. A piece of plasticine or "Prestik" is pressed onto a small plastic sheet and divided into numbered sections. The reference otolith is placed in the quadrant into which the numbered capsule is also firmly pressed. Normally only one or two specimens are taken from their capsules at any one time, and the capsules are stuck next to their otoliths during examination to prevent the possibility of their being mixed up. This allows the unknown specimen from a stomach sample, for example, to be compared directly with reference material of approximately the same size. The use of numbered quadrants allows more than one pair of otoliths to be examined simultaneously whilst reducing the risk of mixing up otoliths.

#### **Otoliths in stomach contents**

Otoliths are used extensively in stomach content analysis because they are one of the last species-specific features to be digested. Although they are composed of protein and calcium carbonate crystals, they are situated in the skull and therefore protected from digestion. After removal from the skulls of the prey or from the stomach contents, the otoliths are washed and air dried. Use of an ultrasonic bath may assist in removal of adhesive tissues.

The cleaned and dried otolith may then be compared with reference material or illustrations. The highly reflective surface of the otolith often makes observation of the characteristic features difficult. This problem may be overcome with the use of a graphite or ammonium chloride coating. A simple graphite method is to scribble on a smooth surface with a soft graphite pencil. A finger can be rubbed into the graphite then gently rubbed onto the surface of the otolith, or graphite powder may be 'painted' onto the otolith using a fine artist's brush. This highlights the cristae surrounding the sulcus and any other features proud of the surrounding surface, allowing them to be seen better under a binocular microscope. The use of a brush is better for fragile otoliths. The ammonium chloride method is described in detail by Hecht (1977). In brief, ammonium chloride crystals are pushed into a narrow glass tube which is held over a cool flame until they sublime. The warm end of the tube is placed close to the otolith and the vapours are gently blown out to coat it. This provides a matt surface which allows features to be seen more easily. As ammonium chloride is extremely hygroscopic, it should be gently brushed from the otolith prior to storage to prevent moisture from collecting on the otolith surface.



**Figure 2.** Otoliths showing erosion of diagnostic features as a result of being subjected to the digestive enzymes and high levels of acidity in the stomach. They were removed from the stomach contents of a dolphin. A 1-3 *Engraulis japonicus*, SSF 55.1; B 1-3 *Pomadasys olivaceum* SSF 179.1: Scale bar 1 mm.

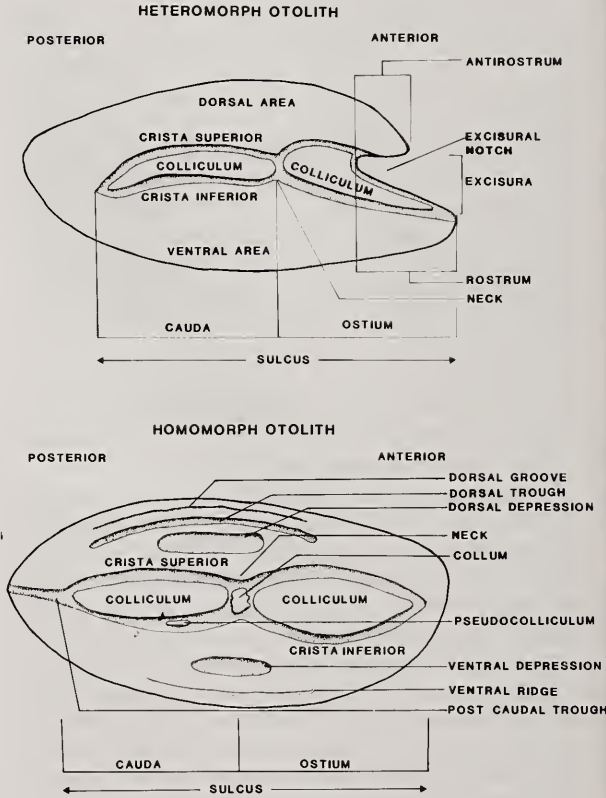
**Effects of digestion**

Digestion of the otoliths has the effect of reducing prominent features and eroding the margins. Consequently the lengths and weights of fish calculated from digested otoliths will markedly underestimate the original size of the prey. How this is compensated will depend on the particular investigation. The features of otoliths undergoing digestion are visibly altered and often the surface of the otolith becomes chalky, as may be seen in the series of otoliths removed from stomach contents (Fig. 2).

**Using the atlas**

The layout used in this atlas is aimed primarily at facilitating identification of otoliths found in stomach contents or archaeological deposits. Prior to reading the individual descriptions, it is essential that readers thoroughly familiarise themselves with the terminology used.

The descriptive terms are illustrated and described in detail to facilitate this process (Fig. 3). Whilst we have attempted to use terms in the literature, their use has been somewhat ambiguous in some cases, and we have redefined all terms and used numerous illustrations in an attempt to reduce misunderstanding. Some of the problems with terminology are due to the difficulties of describing three dimensional objects that are reproduced as two dimensional figures. The limitations of language in this endeavor become apparent when trying to describe subtle differences which vary with growth. This is particularly problematical in the identification keys for species with very similar otoliths. In some cases similarities of features may result from the relatively recent speciation events in the family. In species that communicate using sound, evolution of otoliths with specific acoustic properties would clearly be a driving force in the evolution of otolith morphology, and these one may expect to be more characteristic of the species.



**Figure 3.** Diagrams of the mesial surface of left heteromorph and homomorph otoliths illustrating various features which may be found on otoliths and which are described in the text.



The sequence of families treated is that used by Nelson in *Fishes of the World* (1984). Species are described in alphabetic sequence using the same numbers as *Smiths' Sea Fishes* (Smith & Heemstra, 1986) to help readers using that work as a reference. Synonyms and authors of each species are given in *Smiths' Sea Fishes* (SSF) and are therefore not repeated here unless noted in the text for recent changes.

Particular care needs to be taken where only a single otolith is described in the atlas. Clearly, intraspecific variation cannot be described and this may have implications in the keys provided. The keys are intended as an additional aid to readers, as they highlight characters that are useful in differentiating species. Keys have several limitations, mainly because otoliths have a limited number of features that may be compared. Furthermore, because some features vary with growth, keys and descriptions are most reliable when examining otoliths that are removed from adults of a particular species. Experience and comparative material is necessary to identify otoliths from juveniles and otoliths from members of some families.

Once the terms have been assimilated, the micrographs should be scanned to exclude those families which are obviously not appropriate. Initial attempts to develop a key to families were aborted because of overlaps in descriptive terms used in a wide variety of families. The use of outline diagrams of "typical" members of the family was redundant because of the comprehensive nature of the illustrations in the plates. For these reasons no key to families is provided.

Keys are generally provided when more than one species of a particular family is included in the atlas. In some instances, keys are not given because intraspecific variation was found to be almost as great as interspecific variation. This may be a result of limited material being available for study. In most cases dichotomous keys are provided. When this was not possible, species were either grouped where necessary, or more than one alternative had to be given as the subtle differences were difficult to describe. Be aware that the key is limited by the material available, and that large adults may be different from juveniles or subadults for some species. The keys are not intended as the sole method of otolith identification, but as guides to highlight differences between species, particularly for the inexperienced. The most obvious features are used, as details of colliculi or depths of depressions are difficult to see in fresh material, and are often eroded early in the digestive process. The user must also consider whether other species occur in the area, even if they are not represented in this atlas. There is no guarantee that species not described here are markedly different from those species included, so there is a possibility of misidentification.

The maximum size of each species is given at the end of the distribution notes. This should be compared with the size range of material described in the atlas to determine whether the otoliths described are from juveniles or represent adult fishes. Note that because of individual variation, there may be slight differences in the size order of otoliths compared to fish lengths, leading to apparent differences in the maxima of ranges in the descriptions compared with the

illustrations. Adult otoliths usually show the most characteristic form of that species, and juveniles must be treated with particular caution, as they are often extremely similar in closely related species. Ideally, otoliths recovered from stomach contents should be compared with reference otoliths of a similar size to increase the degree of confidence of identifications. It is also helpful to have a reasonably good idea of the faunal composition of potential prey species in an area, as species that are known not to occur in that region can often be excluded. For example, if the material is from Natal, it is usually safe to assume that the potential prey spectrum excludes species restricted to the Atlantic Ocean. The obvious exception is where knowledge of the fauna is sketchy, for example with offshore and deep water species. The known distribution of each species is given according to *Smiths' Sea Fishes* (Smith & Heemstra, 1986).

## DEFINITIONS

The following terms appear in the same sequence as used in the descriptions. In some cases our definitions vary from usage by previous authors (e.g. Hecht, 1978; Morrow, 1979).

**DISTRIBUTION:** Describes the known range of the species, according to SSF (often in abbreviated form), except where specifically mentioned otherwise. The known maximum size is also given, also from SSF.

**MATERIAL:** The numbers beginning this section give the number of otoliths examined and the total number of otoliths available (e.g. 3/13 means that 3 otoliths were used for the description out of a total of 13 held in the JLBSII and PEM collections). As wide a size range as possible was covered, and generally there is limited intraspecific variation, except where mentioned. This small sample size was necessary to limit the extent of information, such as lengths and ratios, given in the atlas. The size range of material given is provided in brackets. Otolith accession numbers are provided, and these are usually PEM, except where H follows the number, indicating a JLBSII accessioned otolith (previously from the collection of T. Hecht). The collection locality is given, followed by the identifier, when known. Square brackets indicate voucher specimens not specifically used in the descriptions. The distribution and identifiers need not necessarily be the same for the material given in square brackets.

**OTOLITH SHAPE:** In the descriptions and keys, the terms used are illustrated (Fig. 4), although qualifiers are used where appropriate. For example, otoliths of *Lethrinus sanguineus* (185.16) are described as "rounded ovate" to indicate the rounded margins and rounded postero-dorsal corner of an otolith with an approximately ovate appearance. "Discoid" implies an almost circular otolith with a shallow anterior notch. If there is variation in shape within a species, the description may be "oval to rounded triangular" (e.g. *Centroberyx spinosus* 126.3). Where there are ontogenetic changes with growth, the description uses "becoming" to denote this (e.g. "rhomboidal becoming approximately ovate" [*Polysteganus undulosus* 183.32]). The size at which changes occur is usually noted in the text.

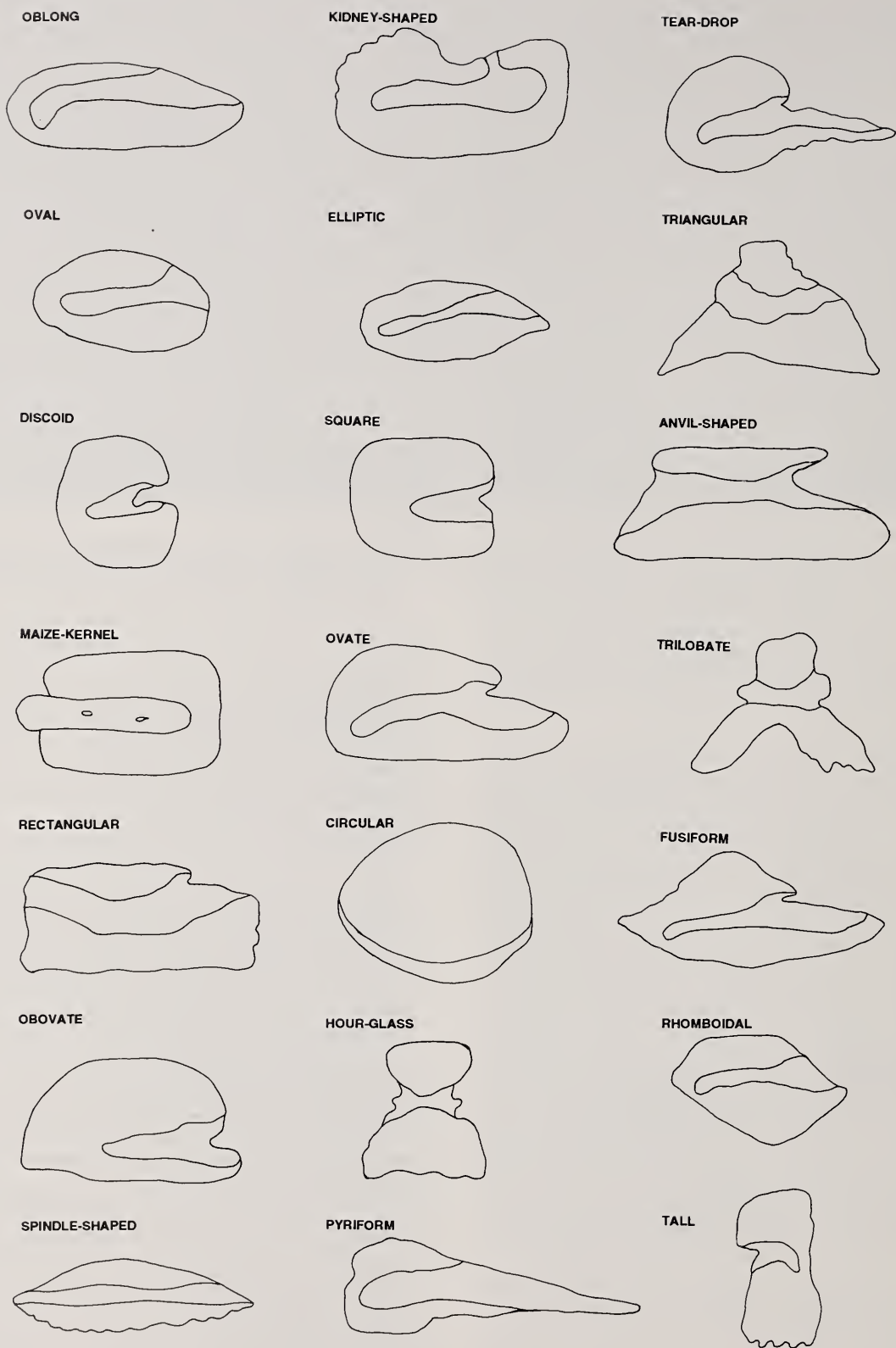
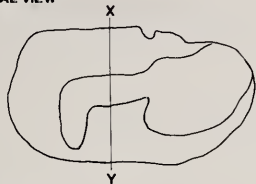


Figure 4. Diagrams illustrating terms used to describe otolith shapes in this atlas.



**THICKNESS:** The thickness of the otolith between the mesial and lateral surfaces is described as extremely thick, very thick, thick, moderate, moderately thin or thin in decreasing thickness (Fig. 5). Some species (e.g. *Centrolophus niger* 254.1) have been described as thin, wafer-like.

MEDIAL VIEW



CROSS SECTIONAL VIEWS

A) OTOLITH: VERY THICK



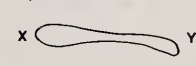
B) OTOLITH: MODERATELY THICK



C) OTOLITH: THICK



D) OTOLITH: THIN



**Figure 5.** Diagrams of otolith form illustrating terms used relating to thickness, mesial and lateral surfaces of an otolith sectioned through the plane XY.

**FORM:** The cross-sectional shape (transverse profile) of the otolith as seen from the dorsal or ventral margins.

**MESIAL:** The surface directed towards the interior or middle plane of the fish shows the prominent features of the otolith. Its shape is described as convex, flat or concave.

**LATERAL:** The side directed towards the exterior of lateral surface of the fish generally has few or no distinguishing features. Its shape is described as convex, flat or concave.

**LATERAL SURFACE FEATURES:** The lateral surface of the otolith, although not photographed, may have characteristic features, such as notches, pits, or grooves and age rings. These are described when useful in distinguishing species or families. If there are no distinct features, this term is omitted.

**MARGIN SHAPE:** The various terms used to describe shapes of the DORSAL, VENTRAL AND POSTERIOR MARGINS are illustrated (Fig. 6). These describe the general outline of that margin. Terms such as rounded, flat, irregular, indented, bulbous are used, sometimes with different sub-areas described separately (e.g. "rounded, emarginate posteriorly" *Gymnothorax rueppelliae* 41.23 or "flattened with indentation at midpoint" *Synodus indicus* 79.7).

**SCULPTURING:** The terms used here are illustrated (Fig. 6). They describe the finer surface features of the margin, which may vary between individuals (e.g.

"sinuate to dentate or entire" *Trachinocephalus myops* 79.10).

**ENTIRE:** Smooth with no indentations.

**LOBED:** Large rounded humps on the margin.

**SINUATE:** Rounded and regular wave-like curves.

**CRENATE:** Regular and compressed humps usually with rounded crests.

**DENTATE:** Regular projections with flattened crests, giving a toothed appearance.

**SERRATE:** Regular pointed projections resembling the teeth of a saw.

**IRREGULAR:** With irregular indentations and humps (i.e. not a smooth margin as in "entire")

ENTIRE



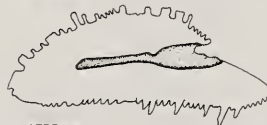
LOBED

SINUATE



CRENATE

DENTATE



SERRATE

IRREGULAR



**Figure 6.** Diagrams illustrating terms used to describe otolith margin sculpturing.

**SULCUS: (or SULCUS ACUSTICUS)** The longitudinal groove or depression on the mesial surface of the otolith (Fig. 7). It may be divided into the ostium and cauda either by a collum or a clear constriction of the dorsal, ventral or both margins of the sulcus. If the sulcus is undivided, the description reads "ostium and cauda undifferentiated" (e.g. *Ogcocephalidae*, *Malthopsis luteus* 104.6). In some species, the differentiation into ostium and cauda is seen only by features on the floor of the sulcus (see pseudo-archaesulcoid), e.g. *Pellona dithela* 54.7. The sulcus generally opens onto one or more margins as follows:

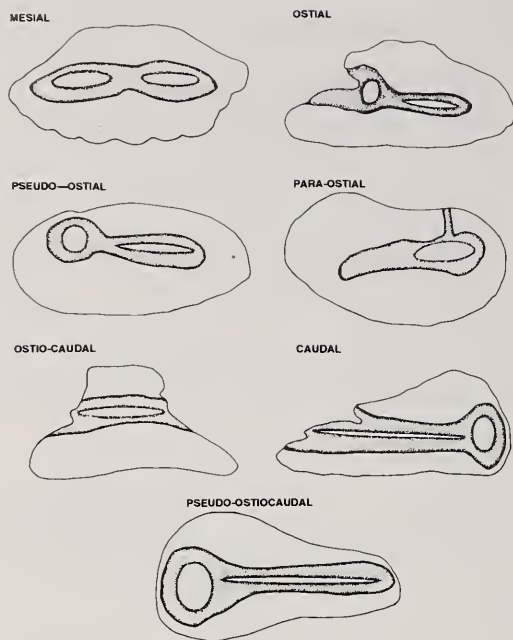
**MESIAL:** The sulcus does not open to any margins of the otolith other than the mesial surface (e.g. *Ophidiidae*).

**OSTIAL:** The sulcus opens onto the anterior (or dorsal) margin, the cauda is closed or becomes indistinguishable well before the posterior margin (e.g. *Sparidae*).

**PSEUDO-OSTIAL:** The ostium lies very close to the anterior (or dorsal) margin but does not open onto it (e.g. *Atrobucca nibe* 199.4).

**PARA-OSTIAL:** The sulcus opening towards the anterior (or dorsal) margin is reduced to a narrow channel or ostial canal (e.g. *Umbrina ronchus* 199.9).

**OSTIO-CAUDAL** (In some literature the term **BIOSTIAL** is used, but this is inaccurate.): The sulcus opens widely to both the anterior and posterior margins



**Figure 7.** Diagrams of otoliths illustrating terms used to describe the principal types of sulcus openings.

(e.g. *Melanonus gracilis* 91.1, *Zeus capensis* 138.4). In some species the walls of the sulcus are unclear, but there is no closure before the sulcus reaches the margin. If the colliculum reaches or penetrates the margin, then the sulcus is considered to be open even if the cristae are not developed or visible.

**CAUDAL:** The sulcus opens to the posterior or ventral margin and the ostium is closed (e.g. *Lepidion capensis* 90.5).

**PSEUDO-OSTIOCAUDAL:** The sulcus ends indistinctly very near to the anterior and posterior margins.

Sulcus types are as follows (Fig. 8):

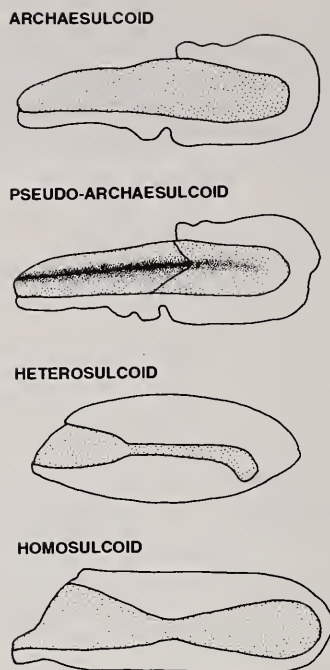
**ARCHAESULCOID:** No clear differentiation into ostium and cauda, both have more or less the same height (i.e. cauda is not narrower). No constrictions are visible on the floor of the sulcus or in the cristae.

**PSEUDO-ARCHAESULCOID:** Sulcus is undifferentiated into ostium and cauda by constrictions of the cristae. They both are approximately the same height, but the ostium and cauda are distinguished by features on the floor of the sulcus, for example, the ostium may be lower than the cauda and may end in a V-shape (e.g. *Scopelosaurus ahlstromi* 78.3, and *Pellona ditchela* 54.7). **NOTE:** If the otolith is not coated for SEM, pseudo-archaesulcoid may appear to be archaesulcoid.

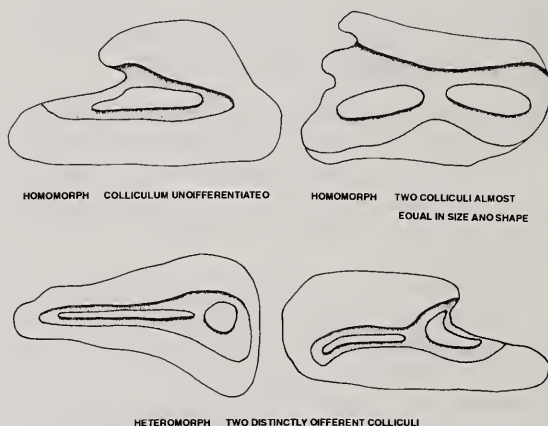
**HETEROSULCOID:** Ostium and cauda are clearly distinguishable and different in shape.

**HOMOSULCOID:** Ostium and cauda are clearly distinguishable (a constriction is present), and they are similar in size and shape.

**COLLICULUM:** The raised part of the sulcus floor (Fig. 9). It may be raised in the ostium (anterior colliculum),



**Figure 8.** Diagrams of otoliths illustrating terms used to describe different sulcus types.



**Figure 9.** Diagrams of otoliths illustrating terms used to describe different colliculum types.

cauda (posterior), or both. In some instances it is raised only at the margins whilst the centre may be depressed. The colliculum may be raised without the ostium and cauda being differentiated.

The types of colliculum are described as follows:

**ABSENT:** No colliculi visible in sulcus. In the descriptions, the term "no raised colliculi" is generally used.

**INDISTINCT:** Colliculi not clearly defined as raised, or without raised margins, floor of sulcus may be uneven. Otoliths which have colliculi that are barely visible (even in the micrograph) are described as low, indistinct or very indistinct. These terms reflect de-



creasing visibility of the colliculi, and these structures are often invisible under a microscope if the otolith is uncoated with gold or ammonium chloride.

**HOMOMORPH:** Either no division into anterior and posterior (colliculum may be single) i.e. undifferentiated, or there may be two colliculi, one in the ostium and one in the cauda, very similar in shape but slightly different in size (e.g. Elopidae, Gadidae, Ophidiidae).

**HETEROMORPH:** Sulcus is differentiated into ostium and cauda of different shapes and contains raised or depressed colliculi (usually with raised margins) of different shapes or single colliculum in either ostium or cauda. **NOTE:** Colliculi may be fused though different in shape (e.g. Sternoptychidae, Iliacanthidae).

**SCOMBROID:** Used by other authors to denote no raised colliculi; sulcus deep with V-shaped cross section (e.g. Scombridae, Morrow 1979). Different members of this family have various developments and shapes associated with the sulcus, hence this term has been avoided in this atlas, as it may lead to confusion.

**INCISIVE:** One of the colliculi has developed into a ridge-like, elongate crest (e.g. Moridae). This term has not been used in this atlas, but the use of this and the following two terms is noted in relation to other publications where appropriate (e.g. Moridae).

**OSTIAL-INCISIVE (O-INCISIVE):** Ostial colliculum is incisive.

**CAUDAL-INCISIVE (C-INCISIVE):** Caudal colliculum is incisive.

**PSEUDOCOLLICULUM:** The collicular crest generally just above the crista inferior (e.g. certain Gadiformes and Myctophidae).

**NECK:** The junction of the ostium and cauda, which is often indicated by a constriction of the crista or sulcus margin. Previous authors have used the term "collum" for this junction.

**OSTIUM:** The anterior portion of the sulcus, anterior to the neck.

**CAUDA:** The posterior portion of the sulcus, posterior to the neck.

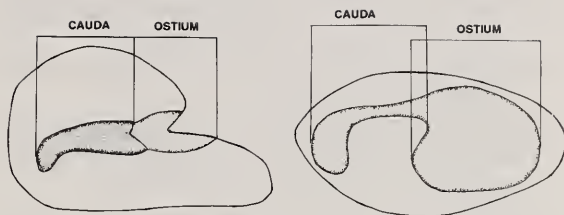
**OSTIO-CAUDAL DIFFERENTIATION:** The constriction of the sulcus that delimits the ostium and cauda. It is usually caused by a flexion of either the crista superior or crista inferior, or both, in the region of the neck. If the sulcus is pseudo-archaesulcoid, the constrictions are seen in features on the floor of the sulcus.

**OSTIUM/CAUDA:** This describes the ratio of the ostium to cauda length (Fig. 10), given individually in size order.

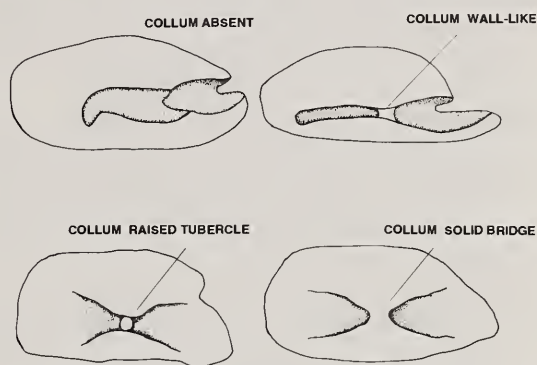
**COLLUM:** A raised tubercle or a wall-like structure that separates the ostium and cauda (Fig. 11). It may appear as a solid bridge, in which case, the ostium and cauda appear as depressed pits (e.g. *Stethojulis interrupta* 220.56, *Aulostomus chinensis* 143.1, *Aluterus monoceros* 264.1). It is often absent.

**CRISTA:** Rim or margin of the sulcus, either dorsal or ventral; may be continuous or broken (Fig. 12).

**CRISTA SUPERIOR:** Dorsal rim or margin of the sulcus



**Figure 10.** Diagrams illustrating the delimitation of the ostium and cauda.



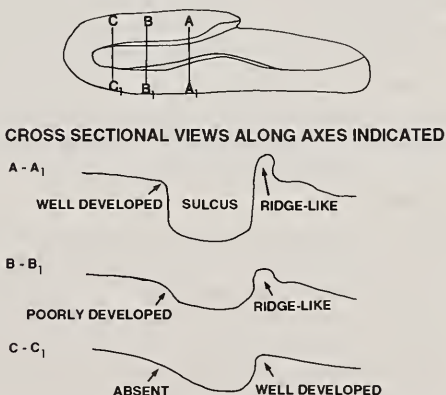
**Figure 11.** Diagrams illustrating different types of collum.

**CRISTA INFERIOR:** Ventral rim or margin of the sulcus. The development of the crista is described as:

**ABSENT:** No clear demarcation between the mesial surface of the otolith and the sulcus.

**POORLY DEVELOPED:** Rim visible but not raised.

**WELL DEVELOPED:** Sulcus clearly demarcated with an obvious margin which is often slightly raised but not ridge-like. Often the sulcus is deep and lies well below the dorsal and ventral areas.



**Figure 12.** Diagrams illustrating crista development of an hypothetically sectioned otolith.

**RIDGE-LIKE:** Sulcus margin raised as a ridge above the dorsal and ventral areas.

**DORSAL DEPRESSION:** Depression in the dorsal area, may have a distinctive shape and may be morphologically different from the rest of the area.

**DORSAL AREA:** The part of the mesial surface of the otolith dorsal to the sulcus.

**VENTRAL DEPRESSION:** Depression in the ventral area, may have a distinctive shape and may be morphologically different from the rest of the area.

**VENTRAL AREA:** The part of the mesial surface of the otolith ventral to the sulcus.

**DORSAL/VENTRAL TROUGH OR GROOVE:** Narrow, elongate depression which is often parallel with the dorsal or ventral margin of the otolith.

**DORSAL/VENTRAL RIDGE:** Narrow, sometimes irregular broken ridge in the dorsal/ventral area, protruding above the surrounding area but separate from the cristae.

**POSTCAUDAL TROUGH:** Groove or depression on the posterior part of the otolith. It lies behind the caudal tip, often on the postero-ventral portion of the otolith and in some otoliths it may extend from the posterior end of the sulcus to the posterior ventral margin of the otolith. It is usually absent.

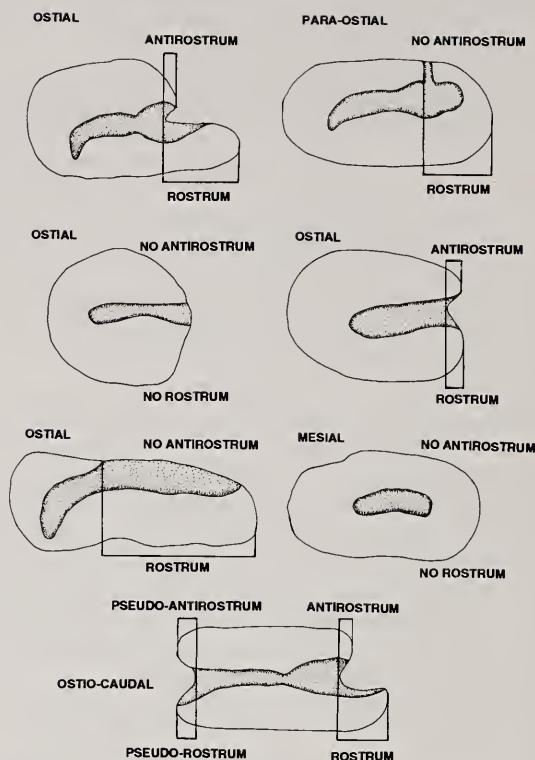
**ROSTRUM:** The anterior extension of the otolith just ventral to the notch of the excisura (Fig. 13), measured from the posterior end of the notch of the excisura. When no notch is present, it is taken to the anterior edge of the crista superior. Para-ostial otoliths may have a rostrum, measured from the posterior-most edge of the canal at the margin. If the sulcus does not open onto the anterior margin there is no rostrum, even though there may be an indentation in the anterior margin; these are mesial and pseudo-ostial opening otoliths (e.g. Gobiidae).

**PSEUDO-ROSTRUM:** The posterior equivalent of the rostrum with the opening of the sulcus caudal or ostio-caudal; it may be measured like the rostrum.

**ANTIROSTRUM:** The antero-dorsal corner or projection of the otolith just dorsal to the notch of the excisura. Measured in a similar way to the rostrum. If it does not project anteriorly over the excisura, and therefore cannot be measured, it is considered absent, and any raised area is considered to be a raised dorsal wall. This may vary within a species, e.g. "broad and rounded but may be absent in small otoliths" (*Persiparsia kopua* 65.7).

**PSEUDO-ANTIROSTRUM:** The equivalent of the antirostrum on the posterior margin, if the opening of the sulcus is caudal or ostio-caudal; it may be measured like the antirostrum.

**EXCISURA:** Opening of the sulcus on the margin (usually anterior) of the otolith. This separates the rostrum and the antirostrum, if present (Fig. 3). There may be a **NOTCH** in the excisura. If the sulcus does not reach the margin of the otolith there is no excisura, even though a notch may be present. In the descriptions the excisura is described (e.g. "narrow" or "wide"), the notch is described (e.g. "shallow" or "deep"), and the angle of the notch is given (e.g. "acute" or "wide").



**Figure 13.** Diagrams of different otolith openings illustrating the position of the rostrum, antirostrum, pseudo-rostrum and pseudo-antirostrum.

**PSEUDO-EXCISURA:** The equivalent of the excisura on the posterior margin, if the opening of the sulcus is caudal or ostio-caudal. Where appropriate this may be described in the text.

## ABBREVIATIONS

### PEOPLE

AB	Avi Baranes: Inter-University Institute, Eilat, Israel.
ABT	A. Ben-Tuvia: (retired), Dept Zoology, Hebrew University of Jerusalem, Israel.
AD	Arik Diamant, Marine Biology Laboratory, Eilat.
AK	Adolph Kotthaus, formerly of Zoologisches Institut und Museum Universität Hamburg, Germany.
ALB	Allen L. Batchelor, formerly PEM.
BCR	Barry C. Russell, Northern Territory Museum, Darwin, Australia.
BR	Barrie Rose, Irvine and Johnson, formerly SFRI.
CDB	Colin D. Buxton, DIFS.
CP	Colin Porter, National Center for Mariculture, Eilat, Israel.
DC	Digby Cyrus, Dept. Zoology, University of Zululand.
DF	David Freidman, Underwater World, Eilat, Israel.
FCS	Fred C. Stinton, (deceased).
GJBR	Graham J.B. Ross, formerly PEM, now: Australia Biological Resources Study (Fauna) GPO Box 636, Canberra, ACT 2601, Australia.



GRA Gerald R. Allen, Western Australian Museum, Perth.  
 HM Hannes Marais, UPE.  
 HMK H.M. Kok, formerly PEM.  
 IE Isabel Eyberg, formerly ORI.  
 IN Izumi Nakamura, Fisheries Research Station, Kyoto University, Japan.  
 IP Ian Paperna, Israel.  
 JEF John E. Fitch, (deceased).  
 JER John Randall, Bernice P. Bishop Museum, Honolulu, Hawaii.  
 JRC John R. Clarke, formerly PEM.  
 LEB Lynnath E. Beckley, ORI.  
 MEA M. Eric Anderson, JLBSII.  
 MHG Marc H. Griffiths, SFRI.  
 MJS Malcolm J. Smale, PEM.  
 MMS Margaret M. Smith, (deceased).  
 OG Ofer Gon, JLBSII.  
 PAH P. A. Hulley, SAM.  
 PC Petra Claus, formerly PEM.  
 PCH Phillip C. Heemstra, JLBSII.  
 PFB Paddy F. Berry, Western Australian Museum, formerly ORI.  
 RHG Robert H. Gibbs, Jr, (deceased).  
 RJM R.J. McKay, Queensland Museum, Australia  
 RvdE Rudy van der Elst, ORI.  
 RWL Robert W. Leslie, SFRI.  
 SAC Simon A. Chater, ORI.  
 STF Sean T. Fennessy, ORI.  
 TH Thomas Hecht, DIFS.  
 TI Tomio Iwamoto, Dept. Ichthyology, California Academy of Sciences, San Francisco.  
 TJM Tim J. Martin, Dept. Zoology, University of Zululand.  
 WDA William D. Anderson, Jr. Grice Marine Biological Laboratory, 205 Fort Johnson, Charleston, SC 29407, USA.

## INSTITUTIONS

DIFS Dept. of Ichthyology and Fisheries Science, Rhodes University, Grahamstown, South Africa.  
 JLBSII J.L.B. Smith Institute of Ichthyology, Grahamstown, South Africa.  
 ORI Oceanographic Research Institute, Durban, South Africa.

PEM Port Elizabeth Museum, South Africa. Also used as accession code for specimens held in PEM collection.  
 PEO Port Elizabeth Oceanarium, Port Elizabeth Museum Complex, South Africa.  
 RU Rhodes University, Grahamstown, South Africa.  
 RUSI Accession code of JLBSII (indicates that the fish specimen is held in the collection of JLBSII).  
 SAM South African Museum, Cape Town, South Africa. Also used as accession code for specimens held in SAM collection.  
 SFRI Sea Fisheries Research Institute, Cape Town, South Africa.  
 UPE University of Port Elizabeth, South Africa.

## FISH MEASUREMENTS

BL Body length, the distance from the posterior operculum margin to the caudal base. May be used in some of the Beloniformes, e.g. Belonidae, where the rostrum may be damaged.  
 FL Fork length, the distance from the tip of snout to the tip of the shortest caudal fin rays.  
 HL Head length, the distance from tip of snout to rear end of operculum.  
 L Left otolith, indicates side from which otolith removed.  
 R Right otolith, indicates side from which otolith removed.  
 PAL Pre-anal length, the distance from the tip of the snout to the vent.  
 SL Standard length, the distance from the tip of the snout to the base of the caudal fin.  
 TL Total length, the length from the tip of the snout to the tip of the longest caudal ray, bent to the horizontal.  
 OD Otolith diameter, the greatest diameter of the otolith.  
 OH Otolith height, the distance from the ventral to the dorsal margin of the otolith.  
 OL Otolith length, the distance from the anterior to the posterior margin of the otolith.

## OTHER

SEM Scanning electron microscope.  
 SSF *Smiths' Sea Fishes* (Smith and Heemstra, 1986).

## ORDER ELOPIFORMES

### ELOPIDAE Nelson No. 43

**Family characteristics:** Based on a single species; otoliths large but delicate, up to at least 11mm OD. Otoliths fusiform, heterosulcoid with ostial openings. Ostium elongate and slightly wider than cauda, cauda straight. Homomorph, anterior colliculum indistinct.

#### *Elops machnata*, SSF No. 36.2 PLATE 1

**DISTRIBUTION:** Recorded from Mossel Bay, South Africa to the Red Sea and India, possibly to west Pacific. Attains about 1 m.

**MATERIAL:** 5/11 - otoliths delicate, often broken on removal - (2.2-11.1 mm OD, 74-904 mm TL), PEM 5837, 5836, 14825, 14813, 2581; estuaries on Cape southeast coast; Id. MJS.

**Otolith shape:** Juveniles (c. 3 mm OD) oval; large otoliths (c. 11 mm OD) oblong to fusiform with rounded posterior margin. **Thickness:** Thin, especially rostral tip. **Form:** - Mesial slightly convex, - Lateral slightly concave anteriorly, slightly convex posteriorly. **Lateral surface:** Grooves radiate dorsally from ventral margin. **Dorsal margin:** Slightly rounded to flat; sculpture, irregular, may be lobed in juveniles (c. 3 mm OD). **Ventral margin:** Rounded and crenate. **Posterior margin:** Rounded, crenate, lobed or irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Homomorph, anterior colliculum indistinct and barely raised, but flat. **Pseudocolliculum:** Absent. **Ostium:** Lies along the rostrum, slightly wider than cauda. **Cauda:** Straight, deep on dorsal side, with steep walls; shallow ventrally; tip poorly defined. **Ostio-caudal differentiation:** Slight dorso-ventral constriction. **Ostium/cauda:** 1:0.9 (5836), 1:1.2 (14825), rest have broken rostral tips. **Collum:** Absent. **Crista superior:** Absent over ostium, well developed and broadly raised above cauda. **Crista inferior:** Poorly developed. **Dorsal depression:** Dorsal margin depressed, wider towards posterior. **Ventral depression:** Absent. **Rostrum:** Large, elongate, wedge-shaped with sharply rounded tip. **Antirostrum:** Absent but there may be sharply raised dorsal margin behind excisura. **Excisura:** Wide, notch absent.

### ALBULIDAE Nelson No. 45

**Family characteristics:** Otolith shape oblong or kidney-shaped up to at least 18.7 mm OD. Heterosulcoid, para-ostial or ostial openings. Ostium oval or elongate, cauda straight or flexed. Homomorph, with anterior colliculum.

#### Key

- 1a. Otolith oblong; dorsal area reduced; cauda strongly flexed as right-angle; ostium nodular, opening ostial  
..... *Albula vulpes* 38.1
- 1b. Otolith kidney shaped, dorsal area relatively wide;  
cauda straight, open at tip; ostium floor smooth, opening  
para-ostial on dorsal margin. . . . . *Pterothrissus belloci* 38.2

#### *Albula vulpes*, SSF No. 38.1 PLATE 1

**DISTRIBUTION:** Taxonomic status of species in the genus *Albula* is currently uncertain. Treated here as in SSF. Tropical seas to Algoa Bay. Attains at least 1 m.

**MATERIAL:** 3/6 (13.3-18.7 mm OD, largest fish, 750 mm TL), PEM 6120, 6111, 7452; M'bibi, Kosi Bay; Id. MJS.

**Otolith shape:** Oblong. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral concave anteriorly, convex and thick posteriorly. **Dorsal margin:** Flattened; sculpture, slightly irregular with an indentation over the caudal flexion. **Ventral margin:** Rounded and approximately entire. **Posterior margin:** Slightly rounded with postero-dorsal corner acutely angulate, sculpture, slightly irregular. **Sulcus acusticus:** Ostial, opening to anterior-dorsal margin, heterosulcoid. **Colliculum:** Homomorph, single anterior colliculum distinct, with rough to nodular surface.

**Pseudocolliculum:** Absent. **Ostium:** Approximately oval and elongate. **Cauda:** Very deep, with right-angled flexion, tip close to margin. **Ostio-caudal differentiation:** Slight dorsal constriction. **Ostium/cauda:** 1:0.7, 1:1, 1:0.7. **Collum:** Absent. **Crista superior:** Absent over ostium, ridge-like over anterior cauda, well developed along posterior cauda. **Crista inferior:** Poorly developed under ostium and anterior cauda well developed along posterior caudal, cauda deep. **Dorsal depression:** Small, at margin, dorsal area very reduced. **Ventral depression:** Absent, ventral area smooth. **Rostrum:** Extremely large and rounded. **Antirostrum:** Absent. **Excisura:** Extremely wide, notch absent.

#### *Pterothrissus belloci*, SSF No. 38.2 PLATE 1

**DISTRIBUTION:** Found off West Africa, common off Guinea and Senegal, reaches Namibia, south of Walvis Bay. Attains 35 cm.

**MATERIAL:** 2/2, same No. (9.4, 9.4 mm OD, 300, 305 mm TL), PEM 1014 a and b; Cape west coast; Id. GJBR.

**Otolith shape:** Kidney-shaped. **Thickness:** Thin. **Form:** - Mesial flat, - Lateral slightly convex. **Dorsal margin:** Emarginate rounded; sculpture, slightly irregular. **Ventral margin:** Rounded, slightly irregular or slightly crenate. **Posterior margin:** Rounded, slightly crenate. **Sulcus acusticus:** Para-ostial, opens onto dorsal surface only, heterosulcoid. **Colliculum:** Homomorph, very low anterior colliculum, depressed in centre. **Pseudocolliculum:** Absent. **Ostium:** Approximately oval, opening in mid-ostium. **Cauda:** Straight, short and tip not closed. **Ostio-caudal differentiation:** Slight dorsal and ventral constriction. **Ostium/cauda:** 1:0.8, 1:1. **Collum:** Absent, but slight step present. **Crista superior:** Absent or poorly developed over the anterior ostium, straight and ridge like from posterior ostium and over the cauda. **Crista inferior:** Poorly developed under the ostium, and caudal region. **Dorsal depression:** Oval, moderately deep above cauda. **Ventral depression:** Absent. **Rostrum:** Very large, broad and rounded. **Antirostrum:** Absent. **Excisura:** Narrow, notch moderate, angle wide.

## ORDER NOTACANTHIFORMES

### HALOSAURIDAE Nelson No. 46

**Family characteristics:** Otolith shape oval with domed dorsal wall, up to at least 3.9 mm OD. Sulcus variable but heterosulcoid with flared ostium and horizontal cauda.

#### Key

- 1a. Dorsal margin raised and domed; sulcus opening pseudo-ostial or ostial; ostium slightly flared; sulcus crystalline; surface of otolith not crystalline . . . . . *Halosauropsis macrochir* 53.3
- 1b. Dorsal margin of otolith slightly rounded or slightly raised (not domed); sulcus opening ostial; ostium flared dorsally; sulcus not distinctly crystalline; surface of otolith crystalline . . . . . *Halosaurus ovenii* 53.4

#### *Halosauropsis macrochir*, SSF No. 53.3 PLATE 1

**DISTRIBUTION:** Off Cape Point and Beira, along continental margins in Atlantic, at Prince Edward Is., Indian Ocean and off New Zealand. Attains c. 90 cm.

**MATERIAL:** 2/2, same No. (3.9 mm OD, 77-86 mm HL), PEM 0952a,b; Tongue of the Ocean, Florida; Id. JEF.

**Otolith shape:** Oval with dorsal margin domed. **Thickness:** Thick. **Form:** - Mesial convex, - Lateral convex. **Dorsal margin:** Domed; sculpture, slightly irregular. **Ventral margin:** Flatter, sinuate or irregular. **Posterior margin:** Rounded or flattened and emarginate and slightly irregular. **Sulcus acusticus:** Pseudo-ostial or ostial, heterosulcoid. **Colliculum:** No raised colliculi.



**Pseudocolliculum:** Absent. **Ostium:** Slightly flared dorsally, deep; entire sulcus crystalline. **Cauda:** Horizontal, dorsal wall steep. **Ostio-caudal differentiation:** Dorsal constriction well defined, ventral may be slight constriction. **Ostium/cauda:** 1:0.8, 1:0.8. **Collum:** Absent. **Crista superior:** Well developed. **Crista inferior:** Poorly developed or absent. **Dorsal depression:** Variable, often circular, may be deep. **Ventral depression:** Absent. **Rostrum:** Small and rounded or absent. **Antirostrum:** Minute or absent. **Excisura:** Narrow or absent.

#### *Halosaurus ovenii*, SSF No. 53.4 PLATE 1

**DISTRIBUTION:** Off Cape Point to Walvis Bay on both sides of the Atlantic. Attains c. 45-50 cm.

**MATERIAL:** 5/8 (1.9-3.5 mm OD, 196-435 mm TL), PEM 14644, 14623, 14686, 14612, 12422; Cape west coast; Id. MJS, lodged in SAM.

**Otolith shape:** Oval with raised dorsal margin in large otoliths. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral slightly convex. **Dorsal margin:** Raised; sculpture, irregular to slightly lobed. **Ventral margin:** Flattened and slightly irregular. **Posterior margin:** Rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Homomorph, indistinct margin of very low colliculum may be visible and crystalline. **Pseudocolliculum:** Absent. **Ostium:** Flared dorsally, shallow. **Cauda:** Deeper and horizontal. **Ostio-caudal differentiation:** Dorsally constricted. **Ostium/cauda:** 1:1.2, 1:1.3, 1:1.5, 1:1.3, 1:0.9. **Collum:** No collum. **Crista superior:** Well developed, may overhang sulcus. **Crista inferior:** Very poorly developed to absent. **Dorsal depression:** Absent but whole mesial surface is crystalline in appearance. **Ventral depression:** Absent. **Rostrum:** Moderately large and broad, sharply rounded. **Antirostrum:** Absent. **Excisura:** Wide, no notch.

#### NOTACANTHIDAE Nelson No. 47

**Family characteristics:** Only one species. Otoliths small, approximately discoid and thick, up to at least 2.5 mm OD. Archaeosulcoid, sulcus may flare on dorsal margin. Dorsal area nodular.

#### *Notocanthus sexspinis*, SSF No. 52.1 PLATE 1

**DISTRIBUTION:** Walvis Bay to Durban; off southern Brazil, Chile, New Zealand and off Australia. Attains 50-60 cm.

**MATERIAL:** 5/62 (1.5-2.5 mm OD, 327-542 mm TL), PEM 14904 (RUSI 35581), 14643, 14903 (RUSI 35566), 9064, 9065, 14666, 14688, [9072-9079 (RUSI 37481)]; Cape west coast; Id. MJS, PCH.

**Otolith shape:** Approximately discoid. **Thickness:** Thick. **Form:** - Mesial convex, - Lateral convex. **Dorsal margin:** Rounded, slightly raised; sculpture, irregular. **Ventral margin:** Flattened or rounded and slightly irregular. **Posterior margin:** Rounded, may be emarginate and irregular. **Sulcus acusticus:** Ostial, archaesusulcoid. **Colliculum:** No raised colliculi. **Pseudocolliculum:** Absent. **Ostium and cauda:** Not differentiated although anterior part of sulcus may flare and sulcus very deep towards the dorsal surface. **Ostio-caudal differentiation:** Not constricted. **Collum:** Absent. **Crista superior:** Well developed, overhangs ostium. **Crista inferior:** Poorly developed, may be a very low ridge under anterior sulcus. **Dorsal depression:** Dorsal area nodular with groove joining small, posterior, horseshoe shaped depression. **Ventral depression:** Absent. **Rostrum:** Very short, broad and rounded. **Antirostrum:** Small or minute and rounded or sharply rounded. **Excisura:** Narrow, if present, notch very shallow and angle wide.

## ORDER ANGUILLIFORMES

### XENOCONGRIDAE Nelson No. 52

**Family characteristics:** Based on a single specimen, otolith small, up to at least 1.4 mm OD, oblong and moderately thick. Dorsal margin flat to slightly convex. Sulcus ends well short of posterior margin, cauda short and slightly curved, opening ostial.

#### *Kaupichthys* sp., SSF No. 43.- PLATE 1

**DISTRIBUTION:** Three species in this genus, one off southern Africa. The specific identity of the material described here is uncertain, genus under revision at the time of writing.

**MATERIAL:** 1/1 (1.35 mm OD, 121 mm TL), PEM 15624, PCH 93C-4; Grand Comoro; Id. PCH.

**Otolith shape:** Approximately oblong. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral convex. **Dorsal margin:** Flat to slightly emarginate, slightly raised posteriorly; sculpture, slightly irregular. **Ventral margin:** Slightly rounded and approximately entire. **Posterior margin:** Oblique, sharply rounded and entire. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** No raised colliculi. **Pseudocolliculum:** Absent. **Ostium:** Slightly flared dorsally. **Cauda:** Short, narrow, almost horizontal with slight ventral curve. Ends well short of posterior margin. **Ostio-caudal differentiation:** Slight dorso-ventral constrictions. **Ostium/cauda:** 1:0.9. **Collum:** Absent. **Crista superior:** Low ridge along entire sulcus. **Crista inferior:** Moderately well developed under ostium, very low ridge under cauda. **Dorsal depression:** Dorsal area above crista is depressed. **Ventral depression:** Narrow, elongate and shallow under crista. **Rostrum:** Short, broad and sharply rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Moderate, notch very shallow, angle wide.

### MURAENIDAE Nelson No. 54

**Family characteristics:** Otoliths elliptic with blunt, emarginate or notched anterior margin, up to at least 4.2 mm OD. Ostial opening to sulcus and homomorph colliculum present. Post-caudal groove usually present at tip of horizontal cauda. Ostium flared with parallel walls.

#### Key

- 1a. Postcaudal groove absent; sulcus wide . . . . . *Gymnothorax flavimarginatus* 41.12
- 1b. Postcaudal groove present; sulcus narrower . . . . . 2
- 2a. Postcaudal groove ends close to notch in posterior margin . . . . . 3
- 2b. Postcaudal groove ends far from posterior margin or notch . . . . . 4
- 3a. Dorsal margin rounded; no notch on posterior margin . . . . . *Gymnothorax undulatus* 41.24
- 3b. Dorsal margin slightly raised and rounded; notch in posterior margin . . . . . *Gymnothorax eurostus* 41.10
- 4a. Posterior margin point situated ventral to midline; point elongate; postcaudal groove slightly curved . . . . . *Gymnothorax rueppelliae* 41.23
- 4b. Posterior margin point in midline; point short; postcaudal groove straight . . . . . *Uropterygius micropterus* 41.31

#### *Gymnothorax eurostus*, SSF No. 41.10 PLATE 2

**DISTRIBUTION:** Transkei to Bazarute, Indo-Pacific. Attains 38 cm.

**MATERIAL:** 1/1 (1.75 mm OD, 193 mm TL), PEM 2853; Sodwana Bay; Id. GJBR.

**Otolith shape:** Elliptic and wedge-shaped. **Thickness:** Moderately thin. **Form:** - Mesial convex, - Lateral flat. **Dorsal margin:** Slightly rounded; sculpture, slightly irregular. **Ventral margin:**



Rounded and slightly irregular. **Posterior margin:** Pointed and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Homomorph, single, indistinct colliculum. **Pseudocolliculum:** Absent. **Ostium:** Short, flares and slopes anteriorly. **Cauda:** Narrower, almost horizontal with slight ventral curve, with shallow post-caudal groove. **Ostio-caudal differentiation:** Slight dorso-ventral constrictions. **Ostium/cauda:** 1:1.8. **Collum:** Absent. **Crista superior:** Moderately well developed. **Crista inferior:** Moderately well developed. **Dorsal depression:** Absent. **Ventral depression:** Very shallow and oval. **Rostrum:** Minute and rounded. **Antirostrum:** Small and pointed. **Excisura:** Moderately wide, notch very shallow, angle wide.

***Gymnothorax flavimarginatus*, SSF No. 41.12**

**PLATE 2**

**DISTRIBUTION:** Common from Transkei northwards, Indo-Pacific. Attains 80 cm.

**MATERIAL:** 2/4 (4.0, 4.2 mm OD, 630, 730 mm TL), PEM 14225, 14226; Comoro Ids; Id. PCH.

**Otolith shape:** Elliptic, truncated anteriorly or wedge-shaped. **Thickness:** Moderately thick. **Form:** - **Mesial** slightly convex, - **Lateral** slightly concave. **Dorsal margin:** Rounded; **sculpture**, slightly irregular. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Pointed and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Homomorph, single, indistinct fused colliculum in sulcus, depressed in centre. **Pseudocolliculum:** Absent. **Ostium:** Short, flares and slopes anteriorly. **Cauda:** Narrower, almost horizontal with slight ventral curve, no post-caudal groove. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:1.5, 1:1.5. **Collum:** Absent. **Crista superior:** Well developed from mid-ostium to cauda, poorly developed at extremes. **Crista inferior:** Well developed, poor at extremes. **Dorsal depression:** Absent. **Ventral depression:** Absent. **Rostrum:** Very short and slightly pointed. **Antirostrum:** Minute and blunt. **Excisura:** Wide, notch very shallow, angle wide.

***Gymnothorax rueppelliae*, SSF No. 41.23 PLATE 2**

**DISTRIBUTION:** Indo-West Pacific from Hawaii to Red Sea and south to Bazaruto Island, Mozambique. Attains 55 cm.

**MATERIAL:** 1/1 (2.5 mm OD, 407 mm TL), PEM 14543 (RUSI 31414); Mauritius; Id. MJS, PCH.

**Otolith shape:** Elliptic, truncate anteriorly. **Thickness:** Medium thin. **Form:** - **Mesial** slightly convex, - **Lateral** very slightly concave. **Dorsal margin:** Rounded, emarginate posteriorly; **sculpture**, slightly irregular. **Ventral margin:** Rounded, slightly irregular. **Posterior margin:** Pointed, slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Homomorph, single low colliculum, indented in centre. **Pseudocolliculum:** Absent. **Ostium:** Short, flared, walls almost parallel. **Cauda:** Narrower, almost horizontal with slight ventral curve, shallow postcaudal groove present. **Ostio-caudal differentiation:** Dorso-ventrally slightly constricted. **Ostium/cauda:** 1:3.4. **Collum:** Absent. **Crista superior:** Well developed, poor at postcaudal trough. **Crista inferior:** Well developed, poor under ostium. **Dorsal depression:** Absent. **Ventral depression:** Absent. **Rostrum:** Very short, bluntly rounded. **Antirostrum:** Very small and pointed. **Excisura:** Moderately wide, notch shallow, angle wide.

***Gymnothorax undulatus*, SSF No. 41.24 PLATE 2**

**DISTRIBUTION:** Common from Port Alfred to southern Mozambique, Indo-Pacific. Attains at least 150 cm.

**MATERIAL:** 4/6 (1.1-3.6 mm OD, 139-420 mm TL), PEM 14260, 4400, 4399, 14229; Comoro Ids and Ledsman Shoal, Natal; Id. MJS, PCH.

**Otolith shape:** Large otoliths (>3 mm OD) elliptic, small (c. 1 mm OD) truncated anteriorly. **Thickness:** Moderately thin. **Form:** - **Mesial** slightly convex, - **Lateral** flat to slightly concave. **Dorsal margin:** Rounded; **sculpture**, slightly irregular. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Pointed approximately in midline and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Homomorph, single colliculum mainly in cauda, depressed in centre. **Pseudocolliculum:** Absent. **Ostium:** Short, flared, more shallow than cauda. **Cauda:** Approximately horizontal, post-caudal groove present. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** (cauda measured to tip of post-caudal trough) 1:2.75, 1:3.0, (4399 broken), 1:1.8. **Collum:** Absent. **Crista superior:** Well developed along entire sulcus, poor along post-caudal trough. **Crista inferior:** Poorly developed along ostium and post-caudal trough, well developed under cauda. **Dorsal depression:** Large otoliths (>3 mm OD) have a shallow, oval depression with a low ridge close to margin above ostium. **Ventral depression:** Absent. **Rostrum:** Minute, rounded. **Antirostrum:** Small and pointed in small otoliths, absent or minute in large specimens. **Excisura:** Wide, in small otoliths (<2 mm OD), moderate in larger (c. 3 mm OD), notch absent or very shallow and angle wide at all sizes.

***Uropterygius micropterus*, SSF No. 41.31 PLATE 2**

**DISTRIBUTION:** Durban northwards; Indo-Pacific. Attains 28 cm.

**MATERIAL:** 1/1 (2.3 mm OD, 310 mm TL), 0636H; off Brighton Beach, Durban; Id. TH.

**Otolith shape:** Elliptic, concave anteriorly. **Thickness:** Moderately thin. **Form:** - **Mesial** slightly convex, - **Lateral** slightly concave. **Lateral surface:** Nucleus area visible and slight step on ventral side. **Dorsal margin:** Rounded with a slight step posteriorly; **sculpture**, slightly irregular. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Sharply pointed and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Homomorph, single, indistinct colliculum, indented in centre. **Pseudocolliculum:** Absent. **Ostium:** Very short, flared. **Cauda:** Almost horizontal, narrow with large and elongate post-caudal groove medially placed. **Ostio-caudal differentiation:** Slight dorso-ventral constriction. **Ostium/cauda:** (including post-caudal trough): 1:3.9. **Collum:** Absent. **Crista superior:** Well developed, poor over trough. **Crista inferior:** Poorly developed below ostium and trough, well developed under cauda. **Dorsal depression:** Shallow and oval. **Ventral depression:** Absent. **Rostrum:** Small, sharply rounded. **Antirostrum:** Small, sharply rounded, approximately equal to rostrum. **Excisura:** Wide, notch moderate, angle wide.

**NEMICHTHYIDAE Nelson No. 55**

**Family characteristics:** These otoliths are very small (<2 mm OD) even in large fish. They are rounded to discoid or square with approximately horizontal sulcus which may be deep or shallow.

**Key**

- 1a. Sulcus archaesulcoid, shallow and horizontal; otolith approximately circular . . . *Nemichthys scolopaceus* 51.4
- 1b. Sulcus heterosulcoid, deep and key-hole like; otoliths approximately discoid . . . . . 2
- 2a. Otolith approximately square and large; ostium flared; neck narrow; dorsal margin of otolith approximately flat and approximately horizontal . . . . . *Nemichthys curvirostris* 51.3
- 2b. Otolith approximately discoid; ostium not distinctly flared; neck very slightly narrowed; dorsal margin of otolith slightly rounded or somewhat flattened . . . . . *Avocettina acuticeps* 51.1



## *Avocettina acuticeps*, SSF No. 51.1 PLATE 2

**DISTRIBUTION:** Known offshore from Cape to Natal; also from Brazil, northern New Zealand and equatorial Pacific. Attains 77 cm.

**MATERIAL:** 3/3, same No. (all c. 0.85 mm OD, c. 500 mm TL), PEM 0941a,b,c; locality unknown; Id. JEF.

**Otolith shape:** Discoid to circular. **Thickness:** Moderately thick. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Slightly rounded; **sculpture,** irregular. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Rounded and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** No raised colliculi. **Pseudocolliculum:** Absent. **Ostium:** Slightly flared and deep. **Cauda:** Short, horizontal, distally rounded and deep. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:0.6, 1:0.6, 1:1.1. **Collum:** Absent. **Crista superior:** Poorly developed in anterior, ridge-like and horse shoe shaped continuing around posterior joining **Crista inferior.** **Dorsal depression:** Shallow, around cauda to posterior end in midline. **Ventral depression:** Absent. **Rostrum:** Short, broad and rounded. **Antirostrum:** Absent or minute and rounded. **Excisura:** Moderate, notch very shallow, angle wide.

## *Nemichthys curvirostris*, SSF No. 51.3 PLATE 2

**DISTRIBUTION:** From the Cape and also widely distributed in Atlantic and Indo-Pacific. Attains about 140 cm (females).

**MATERIAL:** 2/4 (0.45-0.55 mm OD, 1020 mm TL for 0963), 1606H, PEM 0963; localities unknown; Id. JEF.

**Otolith shape:** Discoid to square. **Thickness:** Moderately thin. **Form:** - Mesial flat to slightly concave, - Lateral convex. **Dorsal margin:** Flat; **sculpture,** irregular. **Ventral margin:** Rounded and irregular. **Posterior margin:** Flat and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** No raised colliculi. **Pseudocolliculum:** Absent. **Ostium:** Slightly to moderately flared and deep, with distinct pinched neck. **Cauda:** Rounded tip, angled at about 10 degrees from horizontal. **Ostio-caudal differentiation:** Dorso-ventral constriction, slight in small (0.45 mm OD), distinct in larger (0.55 mm OD) otoliths. **Ostium/cauda:** 1:1.1, 1:1.2. **Collum:** Absent. **Crista superior:** Well developed, sulcus deep with steep walls. **Crista inferior:** Ridge-like along entire sulcus. **Dorsal depression:** Horse-shoe-shaped from neck posteriorly to beneath entire crista inferior, becoming the **ventral depression.** **Rostrum:** Short, broad and rounded. **Antirostrum:** Very short, rounded. **Excisura:** Narrow becoming moderate, notch shallow, angle wide.

## *Nemichthys scolopaceus*, SSF No. 51.4 PLATE 2

**DISTRIBUTION:** Known from the Cape to Natal, also very widely in all oceans. Attains about 120 cm.

**MATERIAL:** 5/8 (0.8-1.2 mm OD, 388-745 mm TL), PEM 13451, 13449, 13446, 13448, 13447; Cape west coast, lodged in SAM.

**Otolith shape:** Circular. **Thickness:** Medium thick. **Form:** - Mesial slightly convex, - Lateral convex. **Dorsal margin:** Rounded; **sculpture,** slightly irregular. **Ventral margin:** Rounded or slightly flattened and slightly irregular. **Posterior margin:** Rounded and slightly irregular. **Sulcus acusticus:** Ostial, archaesusulcoid. **Colliculum:** No raised colliculi. **Pseudocolliculum:** Absent. **Ostium and cauda:** Undifferentiated, shallow and horizontal sulcus. **Ostio-caudal differentiation:** No constrictions. **Collum:** Absent. **Crista superior:** Poorly developed. **Crista inferior:** Poorly developed. **Dorsal depression:** Absent. **Ventral depression:** Absent. **Rostrum:** Very short, broad and sharply rounded. **Antirostrum:** Absent. **Excisura:** Narrow, notch absent.

## SYNAPHOBRANCHIDAE Nelson No. 57

**NOTE:** There may be taxonomic problems in this family; the otoliths of *Diastobranchus capensis* become very globular when larger, more than would normally be expected. The shapes of the sulcus acusticus vary more than usual within a species. Note also that *S. kaupii* has very different placement of the sulcus acusticus compared to that illustrated by Nolf (1985).

**Family characteristics:** Otoliths shapes approximately oval but often highly irregular up to at least 4.7 mm OD. The sulcus acusticus is pseudo-ostial in almost all species described but, because the single, fused colliculum is obvious, they appear to be mesial, particularly when not coated. The otoliths are generally thick.

### Key

- 1a. Posterior margin of otolith flat and very wide; cauda short with broad and rounded tip; dorsal margin may be raised and pointed . . . . . *Synphobranchus kaupii* 46.7
- 1b. Posterior margin rounded or sharply rounded; cauda more elongate and relatively narrow; dorsal margin not raised and pointed . . . . . 2
- 2a. Sulcus dumb-bell shaped; caudal tip flexed and flared; dorsal margin with crest over dorsal depression. . . . . *Dysomma anguillare* 46.2
- 2b. Sulcus moderately elongate; cauda not flared at tip; no crest over dorsal depression . . . . . 3
- 3a. Dorsal margin rounded; dorsal and ventral depressions absent . . . . . *Diastobranchus capensis* 46.1
- 3b. Dorsal margin rounded becoming raised with forked, notched and pointed crest; both dorsal and ventral depression shallow and joined behind cauda . . . . . *Synphobranchus affinis* 46.6

## *Diastobranchus capensis*, SSF No. 46.1 PLATE 2

**DISTRIBUTION:** Off Cape Point in 860m; also Australia and New Zealand. Attains 180 cm.

**MATERIAL:** 8/50 (2.2-4.7 mm OD, 530-1049 mm TL), PEM 13992, 13868, 14488 (RUSI 31463), 13695 (RUSI 28280), 13850, 13852, 14615, 14614, [14470 (RUSI 31424)]; Cape west coast; Id. MJS, PCH.

**Otolith shape:** Very variable - irregular oval. **Thickness:** Thick to very thick in large otoliths. **Form:** - Mesial flat in small (c. 3 mm OD), becoming more convex with growth, - Lateral convex to very convex in large otoliths. **Dorsal margin:** Rounded; **sculpture,** slightly irregular. **Ventral margin:** More flattened edge, slightly irregular or serrate. **Posterior margin:** Rounded and irregular. **Sulcus acusticus:** Pseudo-ostial or ostial, appears mesial in larger otoliths. Anterior delimitation of sulcus acusticus becomes indistinct, heterosulcoid. **Colliculum:** Homomorph, single caudal colliculum may extend to ostium. **Pseudocolliculum:** Absent. **Ostium:** Deeper than cauda, flares anteriorly. **Cauda:** Straight and horizontal. **Ostio-caudal differentiation:** Slight dorso-ventral constrictions. **Ostium/cauda:** 1:1.2, 1:1.1, 1:1, 1:1.1, 1:0.7, 1:1.3, 1:0.8, 1:1.2. **Collum:** Absent. **Crista superior:** Well developed, present along entire sulcus except very anterior. **Crista inferior:** Very poorly developed, absent under ostium. **Dorsal depression:** Absent. **Ventral depression:** Absent. **Rostrum:** Absent or short, broad and rounded. **Antirostrum:** Absent or if present, short, broad and rounded. **Excisura:** Absent or moderate, notch shallow angle wide.





## NETTASTOMATIDAE Nelson No. 59

**Family characteristics:** Only a single species available. Otolith oval up to 3.5 mm OD, smooth, rounded margins, sulcus opening is mesial.

### *Nettastoma parviceps*, SSF No. 47.1 PLATE 3

**DISTRIBUTION:** Southeast coast to southern Mozambique. Also known from Japan, Hawaii, Australia and New Zealand. Attains 82 cm.

**MATERIAL:** 1/1 (3.5 mm OD, 490 mm TL), PEM 14912 (RUSI 35567); Cape south coast; Id. MJS, MEA.

**Otolith shape:** Oval. **Thickness:** Moderately thick. **Form:** - Mesial slightly convex, - Lateral convex. **Dorsal margin:** Rounded; **sculpture**, entire. **Ventral margin:** Rounded and entire. **Posterior margin:** Sharply rounded and entire. **Sulcus acusticus:** Mesial, archaesusloid. **Colliculum:** Homomorph, single raised colliculum. **Pseudocolliculum:** Absent. **Ostium and cauda:** Not differentiated. **Ostio-caudal differentiation:** No constrictions. **Collum:** Absent. **Crista superior:** Absent. **Crista inferior:** Absent. **Dorsal depression:** Absent. **Ventral depression:** Absent. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

## CONGRIDAE Nelson No. 62

**Family characteristics:** Otoliths usually moderately large up to at least 11 mm OD, sulcus opening ostial or mesial, usually with no differentiation into ostium and cauda. Sulcus generally horizontal and generally not flexed, but filled with colliculum.

### Key

- 1a. Otolith opening ostial . . . . . 2
- 1b. Otolith opening mesial or para-ostial . . . . . 4
- 2a. Otolith approximately oval, biconvex and thick; ostium flares dorsally; cauda straight and narrow . . . . . *Gnathophis capensis* 40.9
- 2b. Otolith elongate, moderately thin; ostium and cauda not differentiated but anterior sulcus may flare dorsally . . . . . 3
- 3a. Sulcus ends close to posterior margin; anterior sulcus distinctly flared; rostrum moderately pointed . . . . . *Conger cinereus* 40.7
- 3b. Sulcus ends far from posterior margin; anterior sulcus indistinct; rostrum moderately rounded and broader . . . . . *Conger wilsoni* 40.8
- 4a. Otoliths oval, dorsal margin rounded . . . . . 5
- 4b. Otoliths elongate, dorsal margin slightly rounded or emarginate . . . . . 8
- 5a. Sulcus opening para-ostial; otolith rounded oval. . . . . *Ariosoma mauritianum* 40.1
- 5b. Sulcus opening mesial; otolith irregular oval or elongate . . . . . 6
- 6a. Dorsal margin raised; sulcus below midline of otolith, closer to ventral margin; anterior and posterior tips of otolith tapered and sharply rounded . . . . . *Bassanago albescentis* 40.3
- 6b. Dorsal margin rounded; sulcus centrally placed; anterior and posterior tips of otolith rounded or sharply rounded, not tapered . . . . . 7
- 7a. Otolith broad, dorsal margin of otolith well rounded; dorsal area broad; anterior end of horizontal colliculum blunt, posterior end tapered and not flexed . . . . . *Rhechias wallacei* 40.11
- 7b. Otolith more elongate, dorsal margin of otolith slightly rounded; colliculum tapered anteriorly and posteriorly, slightly flexed at tip . . . . . *Uroconger lepturus* 40.12

- 8a. Dorsal margin of otolith emarginate; otolith kidney shaped; sulcus short and broad . . . . . *Bathyroconger vicinus* 40.5
- 8b. Dorsal margin slightly rounded or emarginate; otoliths oblong; sulcus elongate and narrow . . . . . *Coloconger scholesi* 40.6

### *Ariosoma mauritianum*, SSF No. 40.1 PLATE 3

**DISTRIBUTION:** Indo-West Pacific, occasionally off Natal. Attains 30 cm.

**MATERIAL:** 1/1 - in poor condition - (6.58 mm OD, 278 mm TL), 0285H; IOE Meteor; Id. AK.

**Otolith shape:** Oval. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral very slightly convex. **Dorsal margin:** Rounded; **sculpture**, slightly irregular. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Rounded and slightly irregular. **Sulcus acusticus:** Apparently para-ostial but otolith surface eroded, archaesusloid. **Colliculum:** Apparently homomorph - single low colliculum. **Ostium and cauda:** Undifferentiated, approximately oval and shallow. **Pseudocolliculum:** Absent. **Ostio-caudal differentiation:** No constrictions. **Collum:** Absent. **Crista superior:** Poorly developed. **Crista inferior:** Poorly developed. **Dorsal depression:** Absent. **Ventral depression:** Absent. **Rostrum:** Large, broad and rounded. **Antirostrum:** Absent. **Excisura:** Very narrow, notch absent.

### *Bassanago albescentis*, SSF No. 40.3 PLATE 3

**DISTRIBUTION:** Common off Cape Point, taxonomic status worldwide uncertain. Attains almost 100 cm.

**MATERIAL:** 3/45 (6.4-9.8 mm OD, 449-723 mm TL), PEM 8075, 13795 (RUSI 28279), 14207; Cape west coast; Id. MJS, PCH.

**NOTE:** Variations in otolith morphology suggest that there may be taxonomic problems with the local material.

**Otolith shape:** Oval or oblong. **Thickness:** Thick. **Form:** - Mesial slightly convex, - Lateral very convex. **Lateral surface:** Rounded and smooth. **Dorsal margin:** Rounded, may be raised in centre; **sculpture**, irregular. **Ventral margin:** Rounded, slightly irregular. **Posterior margin:** Sharply rounded and slightly irregular. **Sulcus acusticus:** Mesial, archaesusloid. **Colliculum:** Homomorph - single low, elongate colliculum. **Pseudocolliculum:** Absent. **Ostium and cauda:** Undifferentiated. **Ostio-caudal differentiation:** No constrictions. **Collum:** Absent. **Crista superior:** Well developed. **Crista inferior:** Poor to well developed. **Dorsal depression:** Large and oval in shape. **Ventral depression:** Absent. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

### *Bathyroconger vicinus*, SSF No. 40.5 PLATE 4

**DISTRIBUTION:** Off Cape Point and eastern tropical Atlantic in deep water. Attains 65 cm.

**MATERIAL:** 5/7 (4.3-7.4 mm OD, 456-760 mm TL), PEM 14641, 14639, 14640, 14621, 14620; Cape west coast; Id. MJS.

**Otolith shape:** Elongate kidney-shaped. **Thickness:** Medium thick. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Slightly emarginate; **sculpture**, entire. **Ventral margin:** rounded, entire. **Posterior margin:** Sharply rounded, entire. **Sulcus acusticus:** Mesial, archaesusloid. **Colliculum:** Homomorph, slightly raised, irregular colliculum. **Pseudocolliculum:** Absent. **Ostium and cauda:** Undifferentiated, walls poorly defined. **Ostio-caudal differentiation:** No constrictions. **Collum:** Absent. **Crista superior:** Absent. **Crista inferior:** Absent. **Dorsal depression:** Absent, but may be a circular pit near the dorsal margin in larger otoliths. **Ventral depression:** May be a shallow depression below the colliculum. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.



#### *Coloconger scholesi*, SSF No. 40.6 PLATE 4

**DISTRIBUTION:** Natal and southern Mozambique - probably more widespread; also South China Sea and east Australia. Attains 51 cm.

**MATERIAL:** 2/2 (6.5, 10.5 mm OD, 268, 359 mm TL), PEM 14895 (RUSI 35559), 14894 (RUSI 35580); from 675 m at 34°09.3'S, 26° 51.35'E, Cape southeast coast; Id. MJS, MEA.

**Otolith shape:** Considerable ontogenetic differences in otolith shape: Large otolith oblong, small, oval. **Thickness:** Medium thick. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Slightly rounded (6.5 mm OD) becoming emarginate (10.5 mm OD); **sculpture**, slightly irregular. **Ventral margin:** Rounded, may be notched and slightly irregular. **Posterior margin:** Rounded and slightly lobed. **Sulcus acusticus:** Mesial, archaesusloid. **Colliculum:** Homomorph, single colliculum extends towards anterior margin in larger otoliths. **Pseudocolliculum:** Absent. **Ostium and Cauda:** Not differentiated. **Ostio-caudal differentiation:** No constrictions. **Collum:** Absent. **Crista superior:** Well developed along sulcus. **Crista inferior:** Poorly developed. **Dorsal depression:** Dorsal area slightly concave. **Ventral depression:** Absent. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

#### *Conger cinereus cinereus*, SSF No. 40.7 PLATE 4

**DISTRIBUTION:** Throughout western Indian Ocean, may reach Knysna. Attains 103 cm.

**MATERIAL:** 2/3 (5.7, 7.6 mm OD, 630, 986 mm TL), PEM 10347, 0767; eastern Cape; Id. MMS, MJS.

**Otolith shape:** Oblong. **Thickness:** Medium thick. **Form:** - Mesial approximately flat, - Lateral slightly convex. **Lateral surface:** Has raised ridge close to ventral margin. **Dorsal margin:** Raised and rounded; **sculpture**, irregular. **Ventral margin:** Rounded, slightly irregular. **Posterior margin:** Sharply rounded or blunt and irregular. **Sulcus acusticus:** Ostial, opens onto antero-dorsal margin, archaesusloid. **Colliculum:** Homomorph, single raised colliculum. **Pseudocolliculum:** Absent. **Ostium and Cauda:** Not differentiated. **Ostio-caudal differentiation:** No constrictions. **Collum:** Absent. **Crista superior:** Well developed in mid- to posterior sulcus. **Crista inferior:** Poorly developed, absent at tip. **Dorsal depression:** Absent - may be a ridge in the dorsal area. **Ventral depression:** Absent, margin may be depressed. **Rostrum:** Large, sharply rounded. **Antirostrum:** Absent, dorsal wall slopes sharply behind the excisura. **Excisura:** Narrow or moderate, notch very shallow, angle wide.

#### *Conger wilsoni*, SSF No. 40.8 PLATE 4

**DISTRIBUTION:** Cape to southern Mozambique; also in Australasia and possibly Japan. Attains 150 cm.

**MATERIAL:** 9/22 (2.2-7.46 mm OD, 131-742 mm TL), PEM 10344, 10427, 10428, 0841, 2583, 5336, 5373, 15211, 15229; eastern Cape; Id. MJS, PCH.

**Otolith shape:** Oblong. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly convex. **Lateral surface:** No distinguishing features (<5 mm OD), may be nodules near ventral edge (>6 mm OD). **Dorsal margin:** Rounded and slightly irregular (<7 mm OD), becoming raised (>7 mm OD); **sculpture**, irregular. **Ventral margin:** Rounded and entire to slightly irregular. **Posterior margin:** Sharply rounded and entire (<7 mm OD), becoming irregular (>7 mm OD). **Sulcus acusticus:** Pseudo-ostial in small otoliths (<7 mm OD) becoming ostial (>7 mm OD), archaesusloid. **Colliculum:** Homomorph, single slightly raised colliculum. **Pseudocolliculum:** Absent. **Ostium and cauda:** Undifferentiated. **Ostio-caudal differentiation:** No constrictions. **Collum:** Absent. **Crista superior:** Absent in anterior, well developed posteriorly. **Crista inferior:** Poorly developed, may be ab-

sent. **Dorsal depression:** Shallow oval depression may be present. **Ventral depression:** Absent, margin depressed. **Rostrum:** Absent (<3 mm OD), broad and sharply rounded (>3 mm OD). **Antirostrum:** Absent. **Excisura:** Absent (<3 mm OD), narrow, notch very shallow, angle wide (>3 mm OD).

#### *Gnathophis capensis*, SSF No. 40.9 PLATE 4

**DISTRIBUTION:** False Bay to Plettenberg Bay; also Tristan da Cunha. Attains 37 cm.

**MATERIAL:** 4/5 (6.8-9.1 mm OD, 284-383 mm TL), PEM 11384, 12595, 12596, 12750 (RUSI 28275); Agulhas Bank; Id. MJS, PCH.

**Otolith shape:** Oval. **Thickness:** Thick. **Form:** - Mesial convex, - Lateral convex. **Lateral surface:** In larger otoliths there may be a low ridge along dorsal margin. **Dorsal margin:** Rounded; **sculpture**, entire (6.8 mm OD), becoming lobed (>7 mm OD). **Ventral margin:** Rounded, entire to slightly lobed. **Posterior margin:** Sharply rounded becoming pointed (>7 mm OD), margin entire. **Sulcus acusticus:** Ostial, opening antero-dorsally, heterosulcoid. **Colliculum:** Not clearly defined, in large specimens, anterior and posterior colliculi may be more obvious. **Pseudocolliculum:** Absent. **Ostium:** Flared dorsally. **Cauda:** Straight, deeper towards dorsum. **Ostio-caudal differentiation:** Dorsally constricted. **Ostium/cauda:** 1:1.2, 1:1, 1:1, 1:1.3. **Collum:** Absent. **Crista superior:** Well developed over posterior ostium to cauda. **Crista inferior:** Well developed under cauda, poor under ostium. **Dorsal depression:** Absent or extremely shallow. **Ventral depression:** Absent, shallow, broad groove from rostral tip along anterior third of margin. **Rostrum:** Moderate, broad and sharply rounded. **Antirostrum:** Absent. **Excisura:** Wide, notch absent.

#### *Rhechias wallacei*, SSF No. 40.11 PLATE 4

**DISTRIBUTION:** Natal to southern Mozambique - probably more widespread. Attains 55 cm.

**MATERIAL:** 2/2 (7.6, 7.9 mm OD, 433, 450 mm TL), PEM 13044 (RUSI 28495), 13058 (RUSI 28495); off Mozambique; Id. MJS, PCH.

**Otolith shape:** Oval. **Thickness:** Moderately thick. **Form:** - Mesial slightly convex, - Lateral convex. **Dorsal margin:** Domed; **sculpture**, lobed, slightly irregular. **Ventral margin:** Rounded, may be lobed, entire. **Posterior margin:** Sharply rounded, lobed and slightly irregular. **Sulcus acusticus:** Mesial, archaesusloid. **Colliculum:** Homomorph with single, horizontal colliculum. **Pseudocolliculum:** Absent. **Ostium and cauda:** Undifferentiated. **Ostio-caudal differentiation:** Not constricted. **Collum:** Absent. **Crista superior:** Short and poorly developed over colliculum. **Crista inferior:** Absent. **Dorsal depression:** Large, oval and shallow. **Ventral depression:** Absent. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

#### *Uroconger lepturus*, SSF No. 40.12 PLATE 5

**DISTRIBUTION:** Natal and Mozambique Channel to Red Sea and Indo-Pacific. Attains 45 cm.

**MATERIAL:** 1/1 (4.75 mm OD, c. 319 mm TL), PEM 15488 (RUSI 40548); Tugela Bank; Id. MJS, MEA.

**Otolith shape:** Oval. **Thickness:** Moderately thick. **Form:** - Mesial slightly convex, - Lateral convex. **Dorsal margin:** Slightly raised and rounded; **sculpture**, slightly irregular. **Ventral margin:** Slightly rounded and entire. **Posterior margin:** Sharply rounded and slightly irregular. **Sulcus acusticus:** Mesial, archaesusloid. **Colliculum:** Homomorph, single, distinct, slightly raised and slightly flexed at tip. **Pseudocolliculum:** Absent. **Ostium and Cauda:** Not differentiated, sulcus approximately horizontal. **Ostio-caudal differentiation:** Not constricted. **Collum:** Absent. **Crista superior:** Moderately well developed along entire sulcus.



**Crista inferior:** Moderately well developed along entire sulcus. **Dorsal depression:** Shallow, covers most of dorsal area. **Ventral depression:** Absent. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

**CONGRIDAE Nelson No. 62**  
**(MURAENESOCIDAE in SSF)**

**Family characteristics:** A single representative in this region. Otoliths oval to oblong, up to at least 11.5 mm OD. Heterosulcoid with ostial opening. Heteromorph with two low colliculi.

***Muraenesox bagio*, SSF No. 45.1 PLATE 5**

**DISTRIBUTION:** From Knysna eastwards to at least Durban also Madagascar, Mauritius and elsewhere in Indo-Pacific. Attains 180 cm.

**MATERIAL:** 3/4 (4.8-11.4 mm OD, 470-1805 mm TL), PEM 8829, 0236, 7948; Tugela mouth and Kosi Bay; Id. GJBR, MJS.

**Otolith shape:** Oval to oblong. **Thickness:** Moderately thick. **Form:** - Mesial slightly convex, - Lateral convex. **Dorsal margin:** Flattened, becoming raised posteriorly; **sculpture**, irregular. **Ventral margin:** Rounded in small (c. 4 mm OD), flatter in large (c. 11 mm OD), slightly irregular. **Posterior margin:** Rounded or flattened and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, two low colliculi, may have dorso-ventral banding. **Pseudocolliculum:** Absent. **Ostium:** Flares dorsally. **Cauda:** Straight and horizontal. **Ostio-caudal differentiation:** Dorsally constricted. **Ostium/cauda:** 1:3.4, 1:2.5, 1:2.4. **Collum:** Absent. **Crista superior:** Moderately well developed along entire sulcus length. **Crista inferior:** Poorly developed under ostium, moderately well developed under cauda. **Dorsal depression:** Shallow to absent, there may be another depression at right angles to sulcus at the posterior-dorsal corner. **Ventral depression:** Small and shallow. **Rostrum:** Large, broad and rounded. **Antirostrum:** Absent or very small and rounded. **Excisura:** Wide, notch absent or very shallow and angle wide.

**DERICHTHYIDAE Nelson No. 63**

**Family characteristics:** Single species available. Otolith shape rectangular, up to at least 1.5 mm OD. Archaesulcoid sulcus, opening mesial, has dorsal depression.

***Nessorhamphus ingolfianus*, SSF No. 49.2 PLATE 5**

**DISTRIBUTION:** Found in moderately deep water off the Cape, also worldwide. Attains 40 cm.

**MATERIAL:** 1/1, assumed R otolith (1.5 mm OD, 449 mm TL), PEM 13365; Cape west coast, lodged in SAM.

**Otolith shape:** Rectangular. **Thickness:** Thin. **Form:** - Mesial flat, - Lateral flat. **Lateral surface:** Distinct nucleus in centre. **Dorsal margin:** Flat; **sculpture**, entire. **Ventral margin:** Flat and entire. **Posterior margin:** Flat and entire. **Sulcus acusticus:** Mesial, archaesulcoid. **Colliculum:** No raised colliculum, floor of sulcus smooth. **Pseudocolliculum:** Absent. **Ostium and cauda:** Undifferentiated. **Ostio-caudal differentiation:** Not constricted. **Collum:** Absent. **Crista superior:** Well developed. **Crista inferior:** Absent. **Dorsal depression:** Oval. **Ventral depression:** Absent. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

**SERRIVOMERIDAE Nelson No. 64**

**NOTE:** Only one species described for southern Africa, but Castle (1986, in SSF) notes that the taxonomy is confused. In our material a series of otoliths from the Sargasso Sea differed considerably from the single otolith available to us from the Cape west coast. We therefore tentatively separated the descriptions pending further taxonomic studies.

**Family characteristics:** Otoliths have a characteristic maize kernel shape with colliculum protruding through excisura, up to about 2.1 mm OD. The two species described here differ mainly in the width to length ratios and shape.

**Key**

- 1a. Otolith rectangular, broad maize-kernel shape . . . . . *Serrivomer beanii* 48.1
- 1b. Otolith shape elongate, narrow maize-kernel shape . . . . . *Serrivomer* sp. A. 48.-

***Serrivomer beanii*, SSF No. 48.1 PLATE 5**

**DISTRIBUTION:** Known from off the Cape and Natal; also in Indian Ocean and North Atlantic. Attains 78 cm.

**MATERIAL:** 3/40 (1.25-1.8 mm OD, 420-715 mm TL), 0909H, 1601H, 0904H; Sargasso Sea; Id. D. Smith, Anton Dorn expedition.

**Otolith shape:** Approximately rectangular - like a maize kernel. **Thickness:** Moderately thick. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Slightly rounded or flattened; **sculpture**, entire. **Ventral margin:** Slightly rounded or flattened and entire. **Posterior margin:** Flattened in larger otoliths (>1.3 mm OD), rounded in smaller (1.2 mm OD) and entire. **Sulcus acusticus:** Ostial, archaesulcoid. **Colliculum:** Homomorph single, poorly defined, penetrates excisura, has a deep pit and a deep groove in it, very poorly defined posteriorly. **Pseudocolliculum:** Absent. **Ostium and cauda:** Undifferentiated. **Ostio-caudal differentiation:** No constrictions. **Collum:** Absent. **Crista superior:** Poorly developed along entire sulcus. **Crista inferior:** Absent. **Dorsal depression:** Absent. **Ventral depression:** Absent. **Rostrum:** Small, sharply rounded. **Antirostrum:** Small and rounded. **Excisura:** Colliculum protrudes excisura with dorsal and ventral notch to it.

***Serrivomer* sp. A, SSF No. 48.— PLATE 5**

**DISTRIBUTION:** At least the Cape west coast, general distribution and maximum size uncertain.

**MATERIAL:** 1/1 (2.1 mm OD, 856 mm TL), PEM 13145; Cape west coast, lodged in SAM; Id. GJBR, PAH.

**Otolith shape:** Oblong. **Thickness:** Moderately thick. **Form:** - Mesial slightly convex, - Lateral convex. **Dorsal margin:** Slightly rounded; **sculpture**, entire. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Rounded and entire. **Sulcus acusticus:** Ostial, archaesulcoid. **Colliculum:** Homomorph, colliculum has a pit and a groove in it, very poorly defined posteriorly. **Pseudocolliculum:** Absent. **Ostium and cauda:** Not clearly differentiated. **Ostio-caudal differentiation:** No constrictions. **Collum:** Absent. **Crista superior:** Poorly developed along sulcus. **Crista inferior:** Absent. **Dorsal depression:** Absent. **Ventral depression:** Absent. **Rostrum:** Small, sharply rounded. **Antirostrum:** Small, rounded. **Excisura:** Colliculum protrudes with two notches, dorsal and ventral to it.

**ORDER CLUPEIFORMES**

**CLUPEIDAE Nelson No. 69**

**Family characteristics:** Otoliths usually small (<5 mm), thin, ovate, pseudo-archaesulcoid or heterosulcoid with ostium deeper than cauda, V-shaped posteriorly. Homomorph or heteromorph, usually poorly defined anterior colliculum. Rostrum usually elongate and distinct, crista inferior a straight ridge.

## Key

- 1a. Otoliths ovate to discoid; rostrum short, stubby and very broad . . . . . *Gilchristella aestuaria* 54.3
- 1b. Otoliths ovate; rostrum relatively elongate . . . . . 2
- 2a. Dorsal and ventral margins flat and parallel; rostrum narrow, straight, elongate, may taper slightly; otoliths appear relatively narrow and elongate . . . . . 3
- 2b. Dorsal margin may be flat but ventral margin not flat, usually with one or more notches; rostrum not elongate; otoliths broad . . . . . 4
- 3a. Antirostrum small and pointed; crista superior elongate ridge; ventral margin irregular to dentate . . . . . *Sardinops ocellatus* 54.12
- 3b. Antirostrum relatively broad, angled and pointed; crista superior a short ridge; ventral margin irregular to serrate . . . . . *Sardinella aurita* 54.9
- 4a. Otoliths relatively elongate; no pit under dorsal margin of ostium near neck . . . . . 5
- 4b. Otoliths relatively short and stubby; pit under dorsal margin of ostium near neck . . . . . 9
- 5a. Distinct notch or double notch under neck on ventral margin of otolith . . . . . 6
- 5b. Ventral margin not distinctly notched, sculpture irregular, serrate or dentate . . . . . 8
- 6a. Ventral margin of otolith with two notches, separated by a digitate knob; crista superior well developed over ostium; otolith relatively narrower posteriorly. . . . . *Dussumieria elopsoides* 54.-
- 6b. Ventral margin of otolith with single mid-point notch or indistinct notches; crista superior ridge-like over ostium; posterior of otolith not distinctly narrow . . . . . 7
- 7a. Ventral margin of otolith with distinct notch at mid-point; rostrum relatively short and broad; dorsal margin of otolith slightly rounded, broad posteriorly; otolith appears stubby . . . . . *Etrumeus whiteheadi* 54.2
- 7b. Ventral margin of otolith with indistinct notch or more than one notch; rostrum elongate, tapered and pointed; dorsal margin slightly rounded, posterior margin narrows; otolith appears elongate and tapering . . . . . *Etrumeus teres* 54.1
- 8a. Crista superior approximately straight ridge over neck; no narrowing of postero-ventral corner; usually no notch on posterior margin of otolith; ventral margin of otolith very irregular to digitate . . . *Sardinella gibbosa* 54.10.
- 8b. Crista superior down-flexed over neck; posterior ventral margin with notch-like indentation just anterior to posterior corner; posterior margin of otolith has shallow notch; ventral margin of otolith irregular serrate or dentate . . . *Herklotsichthys quadrimaculatus* 54.4
- 9a. Crista superior formed into short straight ridge over anterior cauda; sculpture of ventral margin with small dentations . . . . . *Sardinella albella* 54.8
- 9b. Crista superior formed into an extremely short ridge at neck; sculpture of ventral margin of otolith serrate or with large dentations . . . . . 10
- 10a. Ventral margin either slightly irregular or with large dentations; ostial pit at neck distinct . . . . . *Pellona ditchela* 54.7
- 10b. Ventral margin serrate; ostial pit at neck less distinct . . . . . *Hilsa kelee* 54.5

## *Dussumieria elopsoides*, (Bleeker, 1849) SSF No. 54.- PLATE 5

**DISTRIBUTION:** From Suez and western Indian Ocean, along coasts of Pakistan, India and Malaysia to western Pacific. Immigrants in eastern Mediterranean (reported as *D. acuta*). Attains c. 20 cm SL (Whitehead 1985).

**MATERIAL:** 1/1 (3.75 mm OD, 179 mm TL), PEM 15392 (RUSI 40589); Madagascar; Id. PCH.

**Otolith shape:** Ovate. **Thickness:** Moderate. **Form:** - **Mesial** approximately flat, - **Lateral** slightly convex. **Lateral surface:** Elongate groove from margin to nucleus from posterior notch. **Dorsal margin:** Slightly raised anteriorly, approximately flat to emarginate; **sculpture**, slightly irregular. **Ventral margin:** Slightly rounded, slightly bi-notched and irregular. **Posterior margin:** Rounded, lobed or dentate, may be slightly notched. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, extremely low and indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Flared dorsally, elongate, lies mainly on rostrum. **Cauda:** Short, approximately oval with margins poorly defined. **Ostio-caudal differentiation:** Dorsally constricted. **Ostium/cauda:** 1:0.5. **Collum:** Absent. **Crista superior:** Well developed over ostium, poorly developed over cauda. **Crista inferior:** Ridge-like from ostium to cauda. **Dorsal depression:** Shallow over neck. **Ventral depression:** Absent. **Rostrum:** Moderately elongate and sharply rounded. **Antirostrum:** Short, broad and pointed. **Excisura:** Wide, notch shallow, angle acute.

### *Etrumeus teres*, SSF No. 54.1 PLATE 5

**DISTRIBUTION:** From Mozambique border to Durban, possibly further south. Elsewhere western North Atlantic, eastern Pacific, Japan, Australia, off Cape Gardafui and in Red Sea (with immigrants into Mediterranean). Attains 25 cm.

**MATERIAL:** 4/4 (3.05-3.4 mm OD, 180-207mm TL), PEM 15692, 15693, 15691, 15694 (all RUSI 42664); Red Sea; Id. MJS.

**Otolith shape:** Ovate. **Thickness:** Moderate. **Form:** - **Mesial** flat or slightly convex, - **Lateral** flat or slightly convex. **Dorsal margin:** Slightly rounded anteriorly, more rounded to slightly tapered posteriorly; **sculpture**, irregular, notched. **Ventral margin:** Approximately flat, may be slightly notched, irregular. **Posterior margin:** Approximately rounded, not bulged; irregular. **Sulcus acusticus:** Ostial, pseudo-archaesulcoid. **Colliculum:** Homomorph, indistinct anterior colliculum with slightly raised edges, depressed centre. **Pseudocolliculum:** Absent. **Ostium:** V-shaped, extends to end of rostrum. **Cauda:** Straight, tapers posteriorly, shallow and rounded in cross section. May be a groove from caudal tip to margin. **Ostio-caudal differentiation:** Very slight dorsal constriction. **Ostium/cauda:** 1:0.6, 1:0.7, 1:0.6, 1:0.7. **Collum:** Absent, may be slight step. **Crista superior:** Well developed to ridge-like over ostium, poor over cauda, well developed at tip. **Crista inferior:** Ridge-like from ostium to cauda, well developed at tip. **Dorsal depression:** Absent but dorsal area slopes into sulcus at gap in crista. **Ventral depression:** No depression, area slopes to margin. **Rostrum:** Moderately elongate, tapered and pointed. **Antirostrum:** Small, angled or sharply rounded. **Excisura:** Wide, notch shallow, with wide angle.

### *Etrumeus whiteheadi*, SSF No. 54.2 PLATE 5

**DISTRIBUTION:** Endemic species, Walvis Bay to Durban (where it overlaps *E. teres*). Attains 20 cm.

**MATERIAL:** 9/170 (1.8-4.4 mm OD, 95-227 mm TL), PEM 10851, 7688 (RUSI 28489), 10762, 12774, 7693 (RUSI 28489), 6857, 12773, 10862, 4657; Cape east and west coasts; Id. MJS, PCH.



**Otolith shape:** Ovate. **Thickness:** Moderate. **Form:** - Mesial flat or slightly convex, - Lateral flat or slightly convex. **Dorsal margin:** Rounded in juveniles (c. 2 mm OD), flatter in larger otoliths (c. 3 mm OD); **sculpture,** irregular, notched. **Ventral margin:** Flatter in anterior, rounded in posterior, sculpture crenate and irregular with distinct notch in midpoint. **Posterior margin:** Rounded and irregular may be notched. **Sulcus acusticus:** Ostial, pseudo-archaesulcoid. **Colliculum:** Homomorph, indistinct anterior colliculum with slightly raised edges, depressed centre. **Pseudocolliculum:** Absent. **Ostium:** V-shaped and deep posteriorly, extends to end of rostrum. **Cauda:** Shallow and rounded in cross section. Caudal tip poorly defined. **Ostio-caudal differentiation:** Very slight dorsal constriction. **Ostium/cauda:** 1:0.7, 1:0.5, 1:0.7, 1:0.9, 1:0.7, 1:0.8, 1:0.6, 1:0.6, 1:0.7. **Collum:** Absent. **Crista superior:** Ridge-like over ostium, well developed or low ridge over cauda, poor at tip. **Crista inferior:** Ridge-like and straight along entire length, posterior tip poorly developed. **Dorsal depression:** Oval, above crista. **Ventral depression:** No depression, area flat, sloping to margin. **Rostrum:** Moderately elongate, broad; sharply rounded tip. **Antirostrum:** Small, pointed or sharply rounded. **Excisura:** Wide, notch shallow, with acute angle.

#### *Gilchristella aestuaria*, SSF No. 54.3 PLATE 6

**DISTRIBUTION:** Estuaries from the Kosi system and Lake Sibaya south to at least Knysna; also Saldanha Bay and possibly north to the Orange River mouth. Attains 65 mm.

**MATERIAL:** 5/8 (0.8-1.8 mm OD, 31-75 mm TL), PEM 1476, 2889, 2155, 2154, 2224; Cape south and east coasts; Id. HMK, MJS.

**Otolith shape:** Compressed and short to discoid in small otoliths (<1 mm OD), becoming ovate. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly convex. **Dorsal margin:** Rounded; **sculpture,** irregular. **Ventral margin:** Rounded and irregular, small (<1 mm OD) are lobed. **Posterior margin:** Rounded to sharply rounded and slightly irregular. **Sulcus acusticus:** Ostial, pseudo-archaesulcoid. **Colliculum:** Homomorph, indistinct anterior colliculum with slightly raised edges, depressed centre. **Pseudocolliculum:** Absent. **Ostium:** Deeper than cauda and V-shaped, flared antero-dorsally. **Cauda:** Shallow and rounded, tip indistinct. **Ostio-caudal differentiation:** Dorsally constricted. **Ostium/cauda:** 1:0.8, 1:0.9, 1:0.8, 1:0.9, 1:0.7. **Collum:** Absent. **Crista superior:** Short and ridge-like at ostio-caudal junction, poor to absent elsewhere. **Crista inferior:** Ridge-like, horizontal along entire sulcus. **Dorsal depression:** Small, shallow and triangular. **Ventral depression:** Absent. **Rostrum:** Short, broad and blunt, becoming longer with growth. **Antirostrum:** Very short and blunt becoming sharply rounded. **Excisura:** Wide, notch moderate and angle wide.

#### *Herklotsichthys quadrimaculatus*, SSF No. 54.4 PLATE 6

**DISTRIBUTION:** Widespread in Indo-Pacific, reaching south to Algoa Bay. Attains 14 cm.

**MATERIAL:** 6/9 (1.4-2.75 mm OD, 56-131 mm TL), 1259H, 1257H, 1260H, 1263H, PEM 15390 (RUSI 40586), 15381 (RUSI 40587); Bazaruto, Madagascar, Gulf of Aqaba; Id. PCH, TH, AD.

**Otolith shape:** Ovate. **Thickness:** Moderately thick. **Form:** - Mesial slightly convex, - Lateral convex. **Dorsal margin:** Flat; **sculpture,** slightly irregular. **Ventral margin:** Straight, slightly emarginate to mid-point in juveniles (c. 1.4 mm OD) becoming approximately straight, slightly irregular becoming serrate or dentate. **Posterior margin:** Oblique or rounded and slightly irregular. **Sulcus acusticus:** Ostial, pseudo-archaesulcoid. **Colliculum:** Homomorph, very indistinct anterior colliculum with slightly raised edges, depressed centre. **Pseudocolliculum:** Absent. **Ostium:**

Dorsally flared, slightly deeper than cauda. **Cauda:** Straight ventrally, slightly flexed dorsal margin and shallow, poorly defined at tip. **Ostio-caudal differentiation:** Dorsally constricted. **Ostium/cauda:** 1:0.8, 1:0.7, 1:0.6, 1:0.6, 1:0.7, 1:0.6. **Collum:** Absent. **Crista superior:** Well developed becoming ridge-like over neck with curve over ostium, poorly developed elsewhere. **Crista inferior:** Straight and ridge-like along most of sulcus, absent in posterior. **Dorsal depression:** Shallow and oval above crista. **Ventral depression:** Absent. **Rostrum:** Elongate and sharply rounded. **Antirostrum:** Small and moderately pointed. **Excisura:** Wide with shallow, wide notch.

#### *Hilsa kelee*, SSF No. 54.5 PLATE 6

**DISTRIBUTION:** Widespread in Indo-Pacific, reaching south to Durban. Attains 24 cm.

**MATERIAL:** 2/3 (4.8-4.85 mm OD, 185-190 mm TL), 0187H, 0186H; Durban; Id. GJBR.

**Otolith shape:** Ovate. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral flat. **Dorsal margin:** Flat, sharply flexed to antirostrum; **sculpture,** slightly irregular. **Ventral margin:** Rounded and serrate, especially in middle. **Posterior margin:** Rounded and slightly irregular. **Sulcus acusticus:** Ostial, pseudo-archaesulcoid. **Colliculum:** Homomorph, anterior colliculum with raised edges with central groove. **Pseudocolliculum:** Absent. **Ostium:** Deep groove along rostrum, floor irregular and a pit at base of antirostrum. **Cauda:** Rounded in cross section, tip pointed. **Ostio-caudal differentiation:** Dorsally constricted. **Ostium/cauda:** 1:0.5, 1:0.6. **Collum:** Absent. **Crista superior:** Ridge-like over neck, poorly developed at extremes, absent in centre of cauda. **Crista inferior:** Straight and ridge-like along sulcus, absent posteriorly. **Dorsal depression:** Oval and shallow. **Ventral depression:** Absent. **Rostrum:** Moderately elongate and pointed. **Antirostrum:** Small broad and pointed. **Excisura:** Wide, notch moderate, angle acute.

#### *Pellona ditchela*, SSF No. 54.7 PLATE 6

**DISTRIBUTION:** Widespread in Indo-Pacific, reaching south to Durban. Attains 16 cm.

**MATERIAL:** 3/3 (4.7-5.05 mm OD, 173-181 mm TL), PEM 15438 (RUSI 40555), 0353, 15439 (RUSI 40555); Durban, Natal; Id. GJBR, MJS, PCH.

**Otolith shape:** Ovate. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral flat. **Dorsal margin:** Flattened, gentle curve to antirostrum (cf. *H. kelee*); **sculpture,** slightly irregular. **Ventral margin:** Rounded and dentate. **Posterior margin:** Rounded and slightly irregular. **Sulcus acusticus:** Ostial, pseudo-archaesulcoid. **Colliculum:** Homomorph, distinct anterior colliculum with raised edges, depressed central groove. **Pseudocolliculum:** Absent. **Ostium:** Deep, V-shaped; flared pit anterior to neck under crista superior. **Cauda:** Shallower and straight, slightly flared dorsally, poorly defined posteriorly. **Ostio-caudal differentiation:** Dorsal constriction. **Ostium/cauda:** 1:0.6, 1:0.6, 1:0.7. **Collum:** Absent. **Crista superior:** Well developed over neck as curved ridge, runs to mid-ostium, poorly developed to absent over both cauda and anterior ostium. **Crista inferior:** Narrow and ridge-like, poorly developed from mid-cauda posteriorly. **Dorsal depression:** Very shallow over cauda. **Ventral depression:** Absent. **Rostrum:** Large and pointed. **Antirostrum:** Small and pointed or sharply rounded. **Excisura:** Wide, notch moderately shallow, angle acute or wide.

#### *Sardinella albella*, SSF No. 54.8 PLATE 6

**DISTRIBUTION:** East coast as far south as Durban, perhaps to East London. Elsewhere widespread throughout Indo-Pacific to Taiwan and Papua/New Guinea. Attains 14 cm.

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**MATERIAL:** 2/2 (3.6, 3.7 mm OD, 170, 172 mm TL), PEM 14553 (RUSI 31405), 14554 (RUSI 31394); Mauritius; Id. MJS, PCH.

**Otolith shape:** Ovate. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral flat. **Dorsal margin:** Straight; sculpture, slightly irregular. **Ventral margin:** Flat and dentate in centre. **Posterior margin:** Rounded and irregular. **Sulcus acusticus:** Ostial, pseudo-archaesulcoid. **Colliculum:** Homomorph, very indistinct anterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Moderately deep, V-shape at posterior not well marked. **Cauda:** Shallow and rounded, poorly defined tip. **Ostio-caudal differentiation:** Dorsally constricted. **Ostium/cauda:** 1:0.6, 1:0.6. **Collum:** Absent. **Crista superior:** Ridge-like from ostium to mid-cauda, absent in posterior. **Crista inferior:** Narrow and ridge-like, poor in posterior. **Dorsal depression:** Fairly deep and oblong. **Ventral depression:** Absent. **Rostrum:** Moderately elongate and sharply rounded. **Antirostrum:** Moderate and pointed. **Excisura:** Wide, notch moderately shallow, angle acute.

#### *Sardinella aurita*, SSF No. 54.9 PLATE 6

**DISTRIBUTION:** Walvis Bay, occasionally to Saldanha Bay. Elsewhere, eastern and western Atlantic, also Mediterranean, perhaps same sp. in Japan. Attains 31 cm.

**MATERIAL:** 2/2 (2.3, 2.85 mm OD, 129, 152 mm TL), PEM 15499, 15498; off Jaffa, Mediterranean; lodged in J.L.B.S.II; Id. D.G.

**Otolith shape:** Ovate. **Thickness:** Moderate. **Form:** - Mesial approximately flat, - Lateral slightly convex. **Dorsal margin:** Slightly rounded becoming flat; sculpture, slightly irregular. **Ventral margin:** Approximately flat, irregular becoming serrate and crenate posteriorly. **Posterior margin:** Slightly rounded and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Homomorph, low and indistinct anterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Elongate, moderately narrow, lying mainly along rostrum. **Cauda:** Horizontal, may be shallow groove from margin to caudal tip. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:0.8, 1:0.6. **Collum:** Absent. **Crista superior:** Ridge-like from ostium to mid-cauda, moderately well developed at tip. **Crista inferior:** Narrow and distinct ridge, poor in posterior. **Dorsal depression:** Elongate in mid-area. **Ventral depression:** Absent, area angled to margin. **Rostrum:** Moderate and sharply rounded becoming elongate and pointed. **Antirostrum:** Small and pointed becoming elongate and pointed. **Excisura:** Wide, notch shallow becoming moderate, angle wide becoming acute.

#### *Sardinella gibbosa*, SSF No. 54.10 PLATE 7

**DISTRIBUTION:** East coast as far south as Durban, possibly East London. Elsewhere, widespread throughout Indo-Pacific, to Philippines, Taiwan and Western Australia. Attains 17 cm.

**MATERIAL:** 3/3 (1.45-3.3 mm OD, 114-180 mm TL), PEM 12452, 15492 (RUSI 40551), 12451; Tugela Bank and Natal; Id. MJS, PCH.

**Otolith shape:** Ovate. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral flat. **Dorsal margin:** Flattened; sculpture, slightly irregular. **Ventral margin:** Approximately straight and dentate to very irregular or digitate. **Posterior margin:** Square and irregular in smaller otoliths (1.45 mm OD), rounded and entire in the larger specimens (3.3 mm OD). **Sulcus acusticus:** Ostial, pseudo-archaesulcoid. **Colliculum:** Homomorph, anterior colliculum very poorly defined. **Pseudocolliculum:** Absent. **Ostium:** Shallow V-shaped, extends along rostrum. **Cauda:** Shallow and rounded. **Ostio-caudal differentiation:** Slight dorsal constriction. **Ostium/cauda:** 1:0.7, 1:0.6, 1:0.7. **Collum:** Absent. **Crista superior:** Ridge-like over the neck to mid-cauda, poor elsewhere. **Crista inferior:** Ridge-like, straight and most prominent in centre, poor to absent at tip. **Dorsal depression:** Oval and deep above ridge. **Ventral depression:** Absent.

**Rostrum:** Elongate and sharply rounded, broader in small otoliths. **Antirostrum:** Moderately elongate and pointed, a distinct feature of large otoliths. **Excisura:** Wide, notch moderately deep, angle acute.

#### *Sardinops ocellatus*, SSF No. 54.12 PLATE 7

**DISTRIBUTION:** Atlantic coast from southern Algoa (Baia dos Tigres) south to Cape Town and northeast to Delagoa Bay. Attains 28 cm.

**MATERIAL:** 8/133 (1.1-4.6 mm OD, 59-244 mm TL), PEM 4862, 7294, 10827, 7257, 7149, 7694 (RUSI 34151), 2509, 10867; Cape coast; Id. MJS, GJBR, PCH.

**Otolith shape:** Ovate. **Thickness:** Thin. **Form:** - Mesial very slightly convex, - Lateral very slightly convex. **Dorsal margin:** Flattened; sculpture, irregular. **Ventral margin:** Flat and irregular to dentate. **Posterior margin:** Rounded to angular and irregular. **Sulcus acusticus:** Ostial, pseudo-archaesulcoid. **Colliculum:** Homosulcoid, indistinct anterior colliculum, raised ventrally. **Pseudocolliculum:** Absent. **Ostium:** Not very deep, V-shaped posteriorly. **Cauda:** Shallow, straight and rounded, poorly defined at tip. **Ostio-caudal differentiation:** Very slight dorsal constriction. **Ostium/cauda:** 1:0.7, 1:0.6, 1:0.5, 1:0.8, 1:0.8, 1:0.6, 1:0.7, 1:0.5. **Collum:** Absent. **Crista superior:** Low and irregular ridge, absent in posterior. **Crista inferior:** Low ridge from ostium to mid-cauda, poorly developed posteriorly. **Dorsal depression:** Oblong and shallow. **Ventral depression:** Absent. **Rostrum:** Elongate, narrow, sharply rounded tip. **Antirostrum:** Small and pointed. **Excisura:** Wide, notch moderately shallow, angle acute.

#### ENGRAULIDAE Nelson No. 70

**Family characteristics:** Otolith size varies with species, up to c. 7.5 mm OD. Shape oblong to fusiform or oval to elliptic, ventral margin rounded, serrate to dentate. Heterosulcoid with poorly defined anterior colliculum with ridge-like caudal cristae.

##### Key

- 1a. No pit at dorsal margin of ostium near neck; otolith elongate oval; posterior margin of otolith and rostrum tapered; cauda oval . . . *Engraulis japonicus* 55.1
- 1b. Pit under dorsal margin of ostium near neck; otolith rounded or rounded oval; posterior margin of otolith not distinctly tapered; rostrum broad; cauda straight . . . . . 2
- 2a. Cristae not well developed except for narrow, low ridge above anterior cauda; tip of cauda not well defined; dorsal depression shallow; rostrum extended and broad . . . . . *Thryssa setirostris* 55.5
- 2b. Cristae well developed, crista superior formed into a distinct ridge along cauda; caudal tip well defined; dorsal depression moderately deep and distinct; rostrum short, broad and rounded, not extended . . . . . *Thryssa vitirostris* 55.6

#### *Engraulis japonicus*, SSF No. 55.1 PLATE 7

**DISTRIBUTION:** Known from the cooler waters of Indo-Pacific, extending round the Cape to Walvis Bay. Attains 13 cm.

**MATERIAL:** 7/178 (1.05-4 mm OD, 46-156 mm TL), PEM 3815, 4330, 10815, 12777, 7315 (RUSI 28284), 7374 (RUSI 28283), 10824, [7102 (RUSI 34125), 7363 (RUSI 34125), 7944 (RUSI 34120)]; Cape south and west coasts; Id. MJS, PCH.

**Otolith shape:** Oblong to fusiform. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly convex. **Dorsal margin:** Gently rounded; sculpture, slightly irregular. **Ventral margin:** Gently rounded, serrate in middle. **Posterior margin:** Sharply rounded and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Homomorph, very low, indistinct anterior colliculum. **Pseudocolliculum:** Absent. **Ostium:**



V-shaped, slightly narrower than cauda. **Cauda:** Short, oval, poorly defined posteriorly. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:0.5, 1:0.7, 1:0.6, 1:0.6, 1:0.6, 1:0.7, 1:0.7. **Collum:** Absent. **Crista superior:** Ridge-like and curved over the cauda, poor over ostium, absent at tip. **Crista inferior:** Ridge-like and curved under the cauda, well developed under ostium. **Dorsal depression:** Absent. **Ventral depression:** Small and shallow below ridge. **Rostrum:** Large and pointed. **Antirostrum:** Small and pointed. **Excisura:** Wide, notch shallow, angle acute.

#### *Thryssa setirostris*, SSF No. 55.5 PLATE 7

**DISTRIBUTION:** East coast, south to Transkei, perhaps to East London, throughout Indian Ocean to Indonesia and China. Attains 15 cm.

**MATERIAL:** 4/17 (3.8-4.9 mm OD, 111-144 mm TL), PEM 15303 (RUSI 36865), 15312, 15314, 15308, [15304-15307 (all RUSI 36865)]; Durban; Id. MJS, PCH.

**Otolith shape:** Oval with notch. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly convex. **Dorsal margin:** Rounded; **sculpture**, slightly irregular. **Ventral margin:** Rounded, serrate to dentate. **Posterior margin:** Rounded to sharply rounded, slightly irregular to serrate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Homomorph, indistinct anterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Pit in dorsal part of ostium anterior to neck, ostium and cauda of similar width. **Cauda:** Straight, poorly defined tip. **Ostio-caudal differentiation:** Slight dorso-ventral constriction. **Ostium/cauda:** 1:0.5, 1:0.5, 1:0.5, 1:0.5. **Collum:** Absent. **Crista superior:** Curved and ridge-like over the cauda, poorly developed but curved over ostium, absent at caudal tip. **Crista inferior:** Ridge-like under the cauda, well developed under ostium. **Dorsal depression:** Small, shallow and oval. **Ventral depression:** Small, under crista inferior. **Rostrum:** Broad and rounded or sharply rounded. **Antirostrum:** Very small and pointed or sharply rounded. **Excisura:** Wide, notch shallow and angle acute.

#### *Thryssa vitirostris*, SSF No. 55.6 PLATE 7

**DISTRIBUTION:** East coast south to Port Alfred. East Africa to Persian Gulf and coasts of India. Attains 22 cm.

**MATERIAL:** 7/27 (5.68-7.4 mm OD, 170-199 mm TL), PEM 1684, 11735 (RUSI 28281), 15301, 15282 (RUSI 36877), 15300, 12453, 15283 (RUSI 36877), [11730 (RUSI 28282)]; Natal; Id. MJS, PCH.

**Otolith shape:** Rounded with notch, to elliptic. **Thickness:** Moderately thin. **Form:** - Mesial convex, - Lateral slightly concave. **Dorsal margin:** Well rounded; **sculpture**, slightly irregular. **Ventral margin:** Well rounded, slightly serrate to dentate. **Posterior margin:** Rounded, slightly irregular or slightly serrate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Homomorph, single, indistinct anterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** With dorsal pit anterior to neck, ostium and cauda of similar width, sulcus angled dorso-posteriorly. **Cauda:** Straight, tip poorly defined. **Ostio-caudal differentiation:** Slight dorso-ventral constriction. **Ostium/cauda:** 1:0.5, 1:0.6, 1:0.6, 1:0.4, 1:0.6, 1:0.5, 1:0.6. **Collum:** Absent. **Crista superior:** Poorly developed over ostium, ridge-like over cauda, slightly curved posteriorly, absent at tip. **Crista inferior:** Poorly or well developed under ostium, ridge-like under cauda. **Dorsal depression:** Large shallow area over cauda. **Ventral depression:** Shallow below cauda. **Rostrum:** Short and broad, bluntly rounded. **Antirostrum:** Small and pointed. **Excisura:** Wide, notch shallow angle acute.

### CHIROCENTRIDAE Nelson No. 71

**Family characteristics:** Only one species; ovate, heterosulcoid, but indistinct separation into ostium and cauda. Well developed rostrum and antirostrum with distinct excisural notch.

#### *Chirocentrus dorab*, SSF No. 56.1 PLATE 8

**DISTRIBUTION:** East coast, south to Durban. Elsewhere, widespread in Indo-Pacific. Attains 100 cm.

**MATERIAL:** 4/8 (2.7-4.6 mm OD, 196-393 mm FL), PEM 9349, 9350, 6431, 5686; Durban; Id. MJS.

**Otolith shape:** Ovate. **Form:** - Mesial slightly convex, - Lateral very slightly concave. **Lateral surface:** Slightly raised nucleus, with a groove originating from a notch on posterior ventral margin. **Thickness:** Moderately thin. **Dorsal margin:** Flat; **sculpture**, slightly crenate to irregular. **Ventral margin:** Flat and crenate to slightly irregular. **Posterior margin:** Square to slightly rounded and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** No raised colliculi. **Pseudocolliculum:** Absent. **Ostium:** Short, broad, V-shaped to central point at neck. **Cauda:** Approximately straight, poorly defined at tip. May be difficult to distinguish from ostium as constrictions slight. **Ostio-caudal differentiation:** Slight dorsal constriction. **Ostium/cauda:** 1:0.9, 1:0.8, 1:0.7, 1:0.8. **Collum:** Absent. **Crista superior:** Well developed over ostium, very short and ridge-like over anterior cauda, well developed posteriorly at tip. **Crista inferior:** Ridge-like from ostium to anterior cauda, well- to poorly developed at extremes. **Dorsal depression:** Dorsal area flat and depressed with grooves. **Ventral depression:** Narrow below ridge. **Rostrum:** Broad and sharply rounded. **Antirostrum:** Large and pointed. **Excisura:** Wide, notch shallow to moderate, angle acute.

### ORDER GONORYNCHIFORMES

#### CHANIDAE Nelson No. 72

**Family characteristics:** The pyriform shape with extremely long, delicate rostrum and approximately straight sulcus with distinct caudal cristae, make these otoliths distinctive. A single species in this family. The differences between these otoliths and those of *Gonorynchus gonorynchus* suggest two distinctly different lineages.

#### *Chanos chanos*, SSF No. 58.1 PLATE 8

**DISTRIBUTION:** Tropical Indo-West Pacific, reaches as far south as the Krom River. Attains 1.8 m.

**MATERIAL:** 3/4 (10.9-c. 15 mm OD - but tips broken, 1142 = 720 mm TL), 0905H, 0230H, PEM 1142; Swartkops River, Algoa Bay; Id. MJS, GJBR, TH.

**Otolith shape:** Pyriform. **Thickness:** Medium thick posteriorly, rostrum thin. **Form:** - Mesial flat, - Lateral convex, raised ridge in centre. **Lateral surface:** Ridge in centre. **Dorsal margin:** Slightly rounded to emarginate and flattened anteriorly; **sculpture**, irregular. **Ventral margin:** Broad and slightly rounded, becoming notched and flattened anteriorly, **sculpture** very irregular. **Posterior margin:** Shape variable, irregular **sculpture**. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** No raised colliculi. **Pseudocolliculum:** Absent. **Ostium:** Narrow, almost entirely filling rostrum, ostio-caudal junction a distinct V. **Cauda:** Slight flare after neck, narrows with slight ventral flexion, becoming a deep trough posteriorly, tip poorly defined. **Ostio-caudal differentiation:** Slight dorso-ventral constriction. **Ostium/cauda:** 1:0.9 (0230H). **Collum:** Absent, step up to cauda. **Crista superior:** Absent over ostium, ridge-like over cauda, absent at tip. **Crista inferior:** Poorly developed under ostium, ridge-like under cauda. **Dorsal depression:** Deep and oval above cauda, dorsal area very



reduced. **Ventral depression:** Deep oval below cauda. **Rostrum:** Extremely elongate (if not broken) and sharply pointed. **Antirostrum:** Absent. **Excisura:** Wide, notch absent.

### GONORYNCHIDAE Nelson No. 73

**Family characteristics:** One species represented here. Otoliths small (<5 mm OD) elliptic to ovate, heterosulcoid, ostium flares dorsally, straight and horizontal cauda with ridge-like cristae.

#### *Gonorynchus gonorynchus*, SSF No. 57.1 PLATE 8

**DISTRIBUTION:** Known from Chile and St Helena in the Atlantic, otherwise Indo-West Pacific, including New Zealand, Australia, Japan and Hawaii. Attains 60 cm.

**MATERIAL:** 6/25 (1.35-4.8 mm OD, 117-416 mm TL), PEM 5135, 5149, 11666, 13061, 3789, 12199; Mozambique, Cape south coast; Id. MJS, PCH.

**Otolith shape:** Small otoliths (c. 1.5 mm OD) oval, becoming elliptic to ovate (>3 mm OD). **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral convex in the posterior. **Dorsal margin:** Rounded; **sculpture**, slightly irregular. **Ventral margin:** Flat and slightly irregular, rostrum may be slightly sinuate. **Posterior margin:** Slightly square or rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Homomorph, indistinct, centrally depressed anterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Deeper than cauda and flared dorsally. **Cauda:** Straight, walls parallel, tip poorly defined. **Ostio-caudal differentiation:** Slight dorsal constriction. **Ostium/cauda:** 1:1, 1:0.9, 1:0.8, 1:0.8, 1:0.6, 1:0.5. **Collum:** Absent but step up to cauda. **Crista superior:** Well developed over the ostium, straight and ridge-like over cauda, absent at tip. **Crista inferior:** Well developed under ostium, short, straight ridge under anterior cauda. **Dorsal depression:** Oval, large, continues around posterior sulcus. **Ventral depression:** Absent. **Rostrum:** Large elongate and pointed (3 mm OD). **Antirostrum:** Minute to absent. **Excisura:** Wide; notch, if present, shallow and angle wide.

### ORDER SILURIFORMES

The otoliths of these fish are developed differently to other orders. The lapillus, or utricular otolith, is much larger than the sagitta or lagena. In all prey identification, archaeological research and most fossil work, these otoliths are the only ones which are found. Consequently, the lapillus is illustrated and described here. For completeness, all three otoliths are illustrated for *Plotosus nkunga*.

### ARIIDAE Nelson No. 108

**Family characteristics:** Otoliths are large and bulbous, usually with a spur. Groove on flattened postero-ventral margin.

#### Key

- 1a. Small spur; otolith circular, but flattened on one side; no protrusion on antero-dorsal margin: *Galeichthys ater* 59.2, *Galeichthys feliceps* - 59.3. (indistinguishable)
- 1b. Large spur; otolith angular; protrusion on dorsal margin . . . . . *Galeichthys* sp. 59.-

#### *Galeichthys ater*, SSF No. 59.2 PLATE 8

**DISTRIBUTION:** Cape south coast to Port Alfred. Attains 45 cm. **MATERIAL:** 5/45 (3.8-11.5 mm OD, 58-285 mm TL), PEM 10079, 10435, 10413, 6950, 6991; Cape south coast, near Cape Recife; Id. MJS.

**Otolith shape:** Circular, but flattened with a small spur on one side. **Thickness:** Very thick and bulbous. **Form:** - Mesial convex and smooth, - Lateral convex and uneven. **Lateral surface:** Raised nucleus and radiating grooves. **Shape of margins:** Rounded, one of the sides flattened or emarginate; **sculpture**, slightly irregular.

**Otolith features:** A short deep groove is found near the spur on ventral side, close to the margin. Groove ends near spur.

#### *Galeichthys feliceps*, SSF No. 59.3 PLATE 8

**DISTRIBUTION:** Found in the sea, estuaries and rivers from Walvis Bay to Natal. Attains 55 cm.

**MATERIAL:** 4/85 (3.2-12.2 mm OD, 52-392 mm TL), PEM 3129, 3121, 10795, 15015 (RUSI 35598), [15014 (RUSI 35598)]; Cape south coast; Id. MJS.

**Otolith shape:** Circular, but one side flattened with a small spur. **Thickness:** Very thick and bulbous. **Form:** - Mesial convex and smooth, - Lateral convex and uneven. **Lateral surface:** Nucleus raised, has radiating grooves. **Shape of margins:** Rounded; **sculpture**, entire to slightly irregular. **Features:** A short deep groove is found near the spur, close to the ventral margin, groove ends near the postero-ventral spur.

#### *Galeichthys* sp., SSF No. 59.— PLATE 8

**DISTRIBUTION:** This presently undescribed species occurs on the eastern coast of South Africa, at least in Transkei, and probably Natal. Attains at least 57 cm.

**MATERIAL:** 3/7 (13.4-16.5 mm OD, 428-578 mm TL), PEM 10361, 9217, 10359; Port St Johns and Coffee Bay, Transkei; Id. MJS.

**Otolith shape:** Approximately square and angular, one side flattened with a large postero-ventral spur with antero-dorsal protrusion. **Thickness:** Very thick and bulbous. **Form:** - Mesial convex and smooth, - Lateral very convex, uneven and lumpy. **Lateral surface:** Raised with uneven hump. **Shape of margins:** Rounded to flattened; **sculpture**, entire to slightly irregular. **Features:** A short deep groove is found near the spur, close to the margin, groove ends near the spur.

### PLOTOSIDAE Nelson No. 109

**Family characteristics:** Relatively large and thick otoliths, the two species found here have distinctly different otoliths.

#### Key

- 1a. Otolith rectangular; surface irregular . . . . . *Plotosus nkunga* 60.2.
- 1b. Otolith circular; semi-circular groove along half of margin . . . . . *Plotosus lineatus* 60.1.

#### *Plotosus lineatus*, SSF No. 60.1 PLATE 9

**DISTRIBUTION:** Throughout the Indo-West Pacific, possibly as far south as Algoa Bay. Attains 32 cm.

**MATERIAL:** 2/3 (4.7, 5.0 mm OD, 211, 223 mm TL), PEM 6470, 6462; PEO; Id. MJS.

**Otolith shape:** Lapillus circular. **Thickness:** Very thick. **Form:** - Mesial convex and smooth, - Lateral flat. **Lateral surface:** Uneven. **Shape of margins:** Rounded; **sculpture**, smooth to slightly crenate or irregular below groove. **Features:** Distinct semicircular groove open to margin on one side only.

#### *Plotosus nkunga*, SSF No. 60.2 PLATE 9

**DISTRIBUTION:** Knysna to Kosi Bay, possibly further north to Zanzibar. Attains 54 cm.

**MATERIAL:** 4/12 (4.0-5.8 mm OD, 313-600 mm TL), PEM 8566, 9928, 9927, 2714; Cape south coast; Id. MJS, PCH.

**Otolith shape:** Approximately rectangular. **Thickness:** Thick. **Form:** - Mesial convex with sharp descent to groove. - Lateral flattened and very irregular. **Shape of margins:** Flattened and entire on two sides, rounded and entire on the third and very irregular on the fourth. **Features:** Raised hump in centre, distinct groove open to margin on one side only, flattened lip near margin below groove.



ORDER SALMONIFORMES  
ARGENTINIDAE Nelson No. 131

**Family characteristics:** Otoliths broad or elongate with pointed rostrum. Heterosulcoid or archaesulcoid, sulcus opening ostial or ostio-caudal, usually not closed at caudal tip. Cauda horizontal.

**Key**

- 1a. Otolith elongate to narrow, elliptic; ventral margin slightly rounded; sulcus shallow; rostrum elongate, narrow and pointed . . . . . *Nansenia macrolepis* 61.3
- 1b. Otolith ovate or ovate to triangular, broad; ventral margin keeled or well-rounded; sulcus deeper; rostrum moderate or prominent, broad and blunt . . . . . 2
- 2a. Otolith ovate to triangular; sulcus opening ostio-caudal; ventral margin keeled, very irregular; rostrum prominent and broad . . . . . *Argentina silus* 61.-
- 2b. Otolith ovate; sulcus opening ostial; ventral margin bulbous, serrate to crenate; rostrum moderate, broad and pointed . . . . . *Glossanodon semifasciatus* 61.-

*Argentina silus*, Ascanius, 1775 SSF No. 61.- PLATE 9

**DISTRIBUTION:** Not yet recorded from this region.

**MATERIAL:** 3/8 (10.2-11.3 mm OD), PEM 7978, 7974, 7973; North Atlantic; Id. PAH.

**Otolith shape:** Ovate to triangular. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral flat. **Dorsal margin:** Approximately straight and notched; **sculpture**, very irregular. **Ventral margin:** Rostrum is serrate, posterior keeled with three points on keel. **Posterior margin:** Flattened or emarginate and irregular. **Sulcus acusticus:** Ostio-caudal, heterosulcoid. **Colliculum:** No raised colliculi. **Pseudocolliculum:** Absent. **Ostium:** Flared, covering most of rostrum, dorsal area forms overhanging lip to ostium. **Cauda:** Straight, deeper and widening posteriorly, slightly dorsally flexed at tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.8, 1:1.3, 1:1.6. **Collum:** Absent, but step up to cauda. **Crista superior:** Well developed over posterior ostium and cauda, straight. **Crista inferior:** Poor to absent under ostium, moderately well developed along entire cauda. **Dorsal depression:** Oval above cauda, second oval depression close to dorsal margin. **Ventral depression:** Absent. **Rostrum:** Prominent, broad and bluntly pointed. **Antirostrum:** Absent. **Excisura:** Wide, notch absent.

*Nansenia macrolepis*, SSF No. 61.3 PLATE 9

**Note:** The taxonomy of this genus is confused, and more than one species may be found off South Africa.

**DISTRIBUTION:** From off Natal and west of Cape Peninsula. May reach 20 cm.

**MATERIAL:** 3/6 (3.7-6.2 mm OD, 13166 = 95 mm TL, 5058 = 123 mm SL), PEM 13166, 13162, 5058 (RUSI 14112); Kenya and Cape west coast; Id. PCH, MJS.

**Otolith shape:** Elliptic. **Thickness:** Thin. **Form:** - Mesial flat, - Lateral slightly convex. **Dorsal margin:** Straight or rounded; **sculpture**, crenate. **Ventral margin:** Slightly rounded and crenate. **Posterior margin:** Rounded and slightly irregular to crenate. **Sulcus acusticus:** Ostial or ostio-caudal, archaesulcoid. **Colliculum:** No raised colliculi. **Pseudocolliculum:** Absent. **Ostium** and **cauda:** Not differentiated, sulcus indistinct posteriorly. **Ostio-caudal differentiation:** No constrictions. **Collum:** Absent. **Crista superior:** Well developed, short ridge in centre. **Crista inferior:** Absent, may have short, well developed area in centre. **Dorsal depression:** Shallow oval depression. **Ventral depression:** Absent. **Rostrum:** Large elongate and pointed. **Antirostrum:** Absent. **Excisura:** Wide, notch absent.

*Glossanodon semifasciatus*, Kishinouye, 1904  
SSF No. 61.— PLATE 9

**DISTRIBUTION:** Recorded locally from Mozambique.

**MATERIAL:** 4/7 (4.0-5.2 mm OD, 111-150 mm TL), PEM 12907, 12905, 12908, 12904 (all except 12905 RUSI 34087); Mozambique; Id. PCH.

**Otolith shape:** Ovate. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly convex. **Lateral surface:** Shallow pit, and rings may be visible. **Dorsal margin:** Flat; **sculpture**, sinuate or lobed. **Ventral margin:** Bulbous, serrate, crenate to irregular. **Posterior margin:** Straight and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** No raised colliculi. **Pseudocolliculum:** Absent. **Ostium:** Large, flared and deeper than cauda, covering most of rostrum. **Cauda:** Straight and open at tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.1, 1:1, 1:1, 1:1. **Collum:** Absent, step up to cauda. **Crista superior:** Well developed over ostium, ridge-like over cauda. **Crista inferior:** Very poorly developed under ostium, poor under cauda. **Dorsal depression:** Oval above crista. **Ventral depression:** Absent. **Rostrum:** Moderate, broad and pointed. **Antirostrum:** Minute and irregular. **Excisura:** Moderately wide, notch very shallow, angle wide.

BATHYLAGIDAE Nelson No. 132

**Family characteristics:** Small (to c. 5.5 mm), oblong to fusiform otoliths, heterosulcoid, with ostial openings and pointed rostrum. Sulcus horizontal, poorly defined caudal tip.

**Key**

- 1a. Rostrum tapered, narrow and pointed; no groove along dorsal margin of rostrum; posterior margin of otolith tapering slightly and sharply rounded; dorsal area broad . . . . . *Bathylagus* sp. 62.-
- 1b. Rostrum elongate, slightly broader; groove along dorsal margin of rostrum; posterior margin of otolith rounded; dorsal area narrower . . . . . 2
- 2a. Rostrum elongate, not distinctly tapered; antirostrum small . . . . . *Bathylagus antarcticus* 62.1
- 2b. Rostrum moderately elongate, tapered; antirostrum absent . . . . . *Bathylagus bericoides* 62.2

*Bathylagus antarcticus*, SSF No. 62.1 PLATE 9

**DISTRIBUTION:** Antarctica, anti-tropical in Pacific and Atlantic Oceans. Attains 15 cm or larger.

**MATERIAL:** 1/1 (5.3 mm OD, 230 mm SL), PEM 13084; Cape west coast, lodged in SAM.

**Otolith shape:** Approximately fusiform. **Thickness:** Thin. **Form:** - Mesial flat, - Lateral slightly convex. **Dorsal margin:** Raised and slightly rounded; **sculpture**, slightly lobed. **Ventral margin:** Slightly rounded and crenate under ostium, slightly irregular. **Posterior margin:** Rounded and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Homomorph, indistinct anterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Slightly flared dorsally, groove along dorsal margin of rostrum. **Cauda:** Straight, deep in the middle, poorly defined at tip. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:1.2. **Collum:** Absent. **Crista superior:** Ridge-like anteriorly, becoming poorly developed at tip. **Crista inferior:** Well developed, poor at extremes. **Dorsal depression:** Oval and deep, dorsal area overhangs ostium as a lip. **Ventral depression:** Absent. **Rostrum:** Elongate and pointed. **Antirostrum:** Small and sharply rounded. **Excisura:** Wide, notch very shallow, angle acute.



### *Bathylagus bericoides*, SSF No. 62.2 PLATE 9

**DISTRIBUTION:** Throughout tropical and subtropical seas. Attains at least 20 cm.

**MATERIAL:** 1/1 (3.6 mm OD, 150 mm SL), PEM 13788; Cape west coast, lodged in SAM.

**Otolith shape:** Oblong to fusiform. **Thickness:** Thin. **Form:** - Mesial flat, - Lateral slightly convex. **Dorsal margin:** Raised and flattened; **sculpture**, slightly lobed. **Ventral margin:** Well rounded and entire. **Posterior margin:** Rounded and entire. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Homomorph, indistinct anterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Flared dorsally, groove along dorsal edge of rostrum. **Cauda:** Straight, poorly defined at tip. **Ostio-caudal differentiation:** Dorsally constricted. **Ostium/cauda:** 1:1.4. **Collum:** Slight step up to cauda. **Crista superior:** Ridge-like, poor at tip. **Crista inferior:** Well developed, poor at extremes. **Dorsal depression:** Shallow - the dorsal area overhangs the ostium as a slight lip. **Ventral depression:** Absent. **Rostrum:** Broad and sharply rounded. **Antirostrum:** Absent. **Excisura:** Wide, notch absent.

### *Bathylagus* sp., SSF No. 62.— PLATE 9

**DISTRIBUTION:** At least Cape west coast. Attains at least 148 mm SL.

**MATERIAL:** 1/1 (3.3 mm OD, 148 mm SL), PEM 13085; Cape west coast; lodged in SAM.

**Otolith shape:** Ovate to elliptic. **Thickness:** Thin. **Form:** - Mesial flat, - Lateral slightly convex. **Dorsal margin:** Distinctly raised, flattened; **sculpture**, slightly lobed. **Ventral margin:** Well rounded and slightly lobed. **Posterior margin:** slightly tapered, sharply rounded and entire. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Homomorph, indistinct anterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Flares dorsally and continues along rostrum. **Cauda:** Straight and deeper than ostium. **Ostio-caudal differentiation:** Slight dorsal constriction. **Ostium/cauda:** 1:1.1. **Collum:** Poorly defined raised area between the ostium and cauda. **Crista superior:** Ridge-like over anterior cauda, well developed over ostium, poor at tip. **Crista inferior:** Well developed in centre, poor at extremes. **Dorsal depression:** Very shallow, oval. **Ventral depression:** Absent. **Rostrum:** Moderately long and pointed. **Antirostrum:** Absent. **Excisura:** Wide, notch shallow, angle wide.

## OPISTHOPROCTIDAE Nelson No. 133

**Family characteristics:** Otolith shape varies from butterfly-like to approximately square or circular. Sulcus either archaesulcoid or heterosulcoid with anterior colliculi or no raised colliculi. The variations within the family may suggest different lineages.

### Key

- 1a. Otolith butterfly shaped; distinct grooves across dorsal and ventral areas . . . . . *Opisthoproctus grimaldii* 63.1
- 1b. Otolith circular or square to oval; no distinct grooves across dorsal and ventral areas . . . . . 2
- 2a. Otolith circular to triangular; sulcus heterosulcoid; rostrum short and blunt . . . *Opisthoproctus soleatus* 63.2
- 2b. Otolith oval to square; sulcus archaesulcoid; rostrum short, very broad, blunt and lobed . . . . .  
. . . . . *Winteria telescopa* 63.4

### *Opisthoproctus grimaldii*, SSF No. 63.1 PLATE 10

**DISTRIBUTION:** One specimen off northern Namibia. Most taken from North Atlantic but there are a few records from the Indo-West Pacific. Attains 70 mm SL.

**MATERIAL:** 1/1 (6.65 mm OD), PEM 14812; Walter Shoal, from stomach of *Tursiops truncatus*, otolith Id. D. Nolf.

**Otolith shape:** Tall - butterfly shaped. **Thickness:** Moderately thick. **Form:** - Mesial slightly convex, - Lateral convex. **Lateral surface:** Grooved towards margins. **Dorsal margin:** Straight, sloping; **sculpture**, serrate, deeply grooved. **Ventral margin:** Sharply pointed keel, anterior margin slightly irregular, becoming crenate, lobed posteriorly. **Posterior margin:** Rounded and lobed. **Sulcus acusticus:** Ostial, archaesulcoid. **Colliculum:** Homomorph, single anterior raised colliculum protrudes through excisura. **Pseudocolliculum:** Absent. **Ostium and cauda:** Undifferentiated, forming a straight sulcus acusticus which is deeper ventrally. **Ostio-caudal differentiation:** No constrictions. **Collum:** Absent. **Crista superior:** Well developed with short ridged crest in centre. **Crista inferior:** Well developed except for short ridge in centre. **Dorsal depression:** Boomerang-shaped along posterior of sulcus, bending dorsally: dorsal area distinctly grooved. **Ventral depression:** Small and under the ridge: Ventral area with uneven pattern and shallow grooves. **Rostrum:** Short, very broad and blunt. **Antirostrum:** Short, very broad and rounded. **Excisura:** Moderate, notch moderately deep, angle wide.

### *Opisthoproctus soleatus*, SSF No 63.2 PLATE 10

**DISTRIBUTION:** Not yet reported from this area, but probably occurs here. Known from Atlantic and Indo-West Pacific. Attains 10 cm.

**MATERIAL:** 2/2 (3.6, 6.8 mm OD, 7964 = 81 mm SL), 0339H, PEM 7964; North Atlantic; Id. PAH, A.K.

**Otolith shape:** Rounded to triangular. **Thickness:** Thick. **Form:** - Mesial flat. - Lateral convex, forming posterior bulge. **Lateral surface:** Margin grooved. **Dorsal margin:** Approximately straight; **sculpture**, with indentations, becoming serrate in large otoliths (c. 6.8 mm OD). **Ventral margin:** Bulbous, entire anteriorly, lobed posteriorly. **Posterior margin:** Slightly rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Homomorph, single anterior colliculum at front of ostium. **Pseudocolliculum:** Absent. **Ostium:** Flared slightly dorsally. **Cauda:** Straight not distinctly closed at tip. **Ostio-caudal differentiation:** Slight dorso-ventral constriction. **Ostium/cauda:** 1:1.9, 1:2.1. **Collum:** Absent but slight step to cauda. **Crista superior:** Poor to absent over ostium, ridge-like over cauda with uneven, lobed appearance in large otoliths. **Crista inferior:** Poor under ostium, ridge-like under cauda. **Dorsal depression:** Absent, dorsal area concave and grooved. **Ventral depression:** Shallow depression below ostium. **Rostrum:** Short, broad and blunt. **Antirostrum:** Small and angular. **Excisura:** Moderate, notch shallow with acute angle.

### *Winteria telescopa*, SSF No. 63.4 PLATE 10

**DISTRIBUTION:** Circumglobal. Recently recorded from Cape west coast. Attains 16 cm.

**MATERIAL:** 1/1 (4.1 mm OD, 146 mm TL), PEM 13328; Cape west coast, lodged in SAM.

**Otolith shape:** Square to circular. **Thickness:** Moderately thick. **Form:** - Mesial slightly concave, - Lateral slightly convex. **Lateral surface:** Raised nucleus in centre, growth rings visible. **Dorsal margin:** Rounded; **sculpture**, irregular. **Ventral margin:** Flat and lobed. **Posterior margin:** Flat and irregular. **Sulcus acusticus:** Ostial, archaesulcoid. **Colliculum:** No raised colliculi. **Pseudocolliculum:** Absent. **Ostium and cauda:** Not differentiated, forming an oval sulcus, deep in the centre. **Collum:** Absent. **Crista superior:** Poorly developed, crescentic in shape. **Crista inferior:** Short, straight elevated section on the rostral tip which is disconnected from the crescentic, poorly developed crista. A domed ridge occurs postero-ventrally. **Dorsal depression:** Most of dorsal area depressed, becoming deeper close to dorsal margin. **Ventral depression:** Crescentic shape under sulcus. **Rostrum:**



Very broad, blunt and lobed. **Antirostrum**: Broad, short and rounded. **Excisura**: Moderate, notch shallow, angle wide.

**ALEPOCEPHALIDAE Nelson No. 134**

**Family characteristics**: Approximately ovate, raised dorsal margin with distinct rostrum. Heterosulcoid with ostium deeper than cauda. Usually ostio-caudal, crista superior usually ridge-like over ostium. Colliculi indistinct or absent.

**Key**

- 1a. Otolith squarely ovate; crista superior poorly developed; rostrum short, broad, rounded and irregular . . . . . *Xenodermichthys copei* 64.18
- 1b. Otolith ovate; crista superior well developed or ridge-like; rostrum sharply rounded . . . . . 2
- 2a. Crista superior relatively poorly developed, ridge less distinct; ostium shallower than 2b; ventral margin of otolith slightly irregular; dorsal margin rounded . . . . . *Alepocephalus australis* 64.1
- 2b. Crista superior with distinct broad ridge; ostium deep; ventral margin of otolith distinctly serrate; dorsal margin domed posteriorly . . . . . *Alepocephalus* sp. 64.-

***Alepocephalus australis*, SSF No. 64.1 PLATE 10**

**DISTRIBUTION**: Apparently widely distributed in temperate waters of southern hemisphere; a similar Atlantic form north of 15°S may not be conspecific. Benthopelagic. Attains at least 60 cm SL. **MATERIAL**: 7/17 (3.4-6.8 mm OD, 230-469 mm TL), PEM 13781, 13780, 13774, 13773, 13779, 13775, 13481; Cape west coast, lodged in SAM.

**Otolith shape**: Ovate. **Thickness**: Moderately thin. **Form**: - Mesial flat, - Lateral slightly convex. **Dorsal margin**: Rounded; **sculpture**, entire to slightly irregular. **Ventral margin**: Straight and irregular to slightly sinuate. **Posterior margin**: Straight or notched and irregular. **Sulcus acusticus**: Ostio-caudal, heterosulcoid. **Colliculum**: No raised colliculi. **Pseudocolliculum**: Absent. **Ostium**: Horizontal, extends along rostrum, deeper than cauda flares dorsally in larger otoliths. **Cauda**: Poorly defined, flares slightly posteriorly and opens onto posterior margin. **Ostio-caudal differentiation**: Slight dorsal constriction. **Ostium/cauda**: 1:0.9, 1:0.9, 1:0.7, 1:0.7, 1:0.7, 1:0.7, 1:0.8. **Collum**: Absent, but step up to shallow cauda. **Crista superior**: Ridge-like, forms a lip over ostium, less well developed posteriorly. **Crista inferior**: Poorly developed along entire sulcus. **Dorsal depression**: A slight groove occurs where the dorsal area meets the crista superior. **Ventral depression**: Absent. **Rostrum**: Large, blunt, becomes sharply rounded with growth. **Antirostrum**: Small, broad, well rounded, becomes larger with growth. **Excisura**: Wide, notch shallow and angle wide to acute in larger otoliths.

***Alepocephalus* sp., SSF No. 64.- PLATE 10**

**DISTRIBUTION**: Uncertain. **MATERIAL**: 1/1 (4.4 mm OD, 294 mm TL), PEM 14473 (RUSI 31407); Cape west coast; Id. MJS - confirmed by MEA as *A. australis* but has a distinctly different otolith which may suggest taxonomic problems, therefore this otolith treated separately here.

**Otolith shape**: Ovate. **Thickness**: Moderately thin. **Form**: - Mesial flat, - Lateral convex. **Dorsal margin**: Domed posteriorly, emarginate anteriorly; **sculpture**, entire. **Ventral margin**: Slightly rounded and serrate. **Posterior margin**: Irregular, dorsally rounded, notched and irregular. **Sulcus acusticus**: Ostio-caudal, heterosulcoid. **Colliculum**: Homomorph, low anterior colliculum. **Pseudocolliculum**: Absent. **Ostium**: Horizontal, very deep, flares slightly at anterior. **Cauda**: Shallow, opens at notch. **Ostio-caudal differentiation**: Slight dorsal constriction.

**Ostium/cauda**: 1:0.5. **Collum**: Present, wall-like structure. **Crista superior**: Ridge-like over ostium, becoming reduced posteriorly. **Crista inferior**: Well developed under ostium, poor under cauda. **Dorsal depression**: Boomerang-shaped, curving up posteriorly. **Ventral depression**: Absent. **Rostrum**: Broad and moderately short, sharply rounded. **Antirostrum**: Short, broad and rounded. **Excisura**: Moderate, notch shallow, angle acute.

***Xenodermichthys copei*, SSF No. 64.18 PLATE 10**

**DISTRIBUTION**: Common off South Africa and Madagascar Ridge; widely distributed in Atlantic, tropical Pacific, Tasman Sea, Great Australian Bight and Indian Ocean. Attains 20 cm SL. **MATERIAL**: 2/2 (1.9-2.5 mm OD, c. 122-163 mm TL), PEM 14889 (RUSI 35524), 13394; Cape west and south coasts; Id. PAH, MJS.

**Otolith shape**: Squarely ovate. **Thickness**: Moderately thin. **Form**: - Mesial slightly concave, - Lateral convex. **Dorsal margin**: Rounded to angular; **sculpture**, irregular. **Ventral margin**: Approximately flat and irregularly lobed. **Posterior margin**: Straight and entire. **Sulcus acusticus**: Ostial (may be ostio-caudal, indistinct), heterosulcoid. **Colliculum**: No raised colliculi. **Pseudocolliculum**: Absent. **Ostium**: Moderately wide, deeper than cauda. **Cauda**: Indistinct dorsally. **Ostio-caudal differentiation**: Dorsally constricted. **Ostium/cauda**: 1:0.7, 1:0.9. **Collum**: Absent. **Crista superior**: Poorly developed over ostium, absent posteriorly. **Crista inferior**: Strong, double ridge with pits, narrowing anteriorly, extends along the entire sulcus. **Dorsal depression**: Absent. **Ventral depression**: Absent. **Rostrum**: Broad and short, rounded and irregular. **Antirostrum**: Small, broad and rounded. **Excisura**: Narrow, notch shallow and angle wide.

**SEARSIIDAE Nelson No. 135  
(PLATYTROCTIDAE in SSF)**

**Family characteristics**: Otoliths ovate, ostium deep, cauda shallow and indistinct. Ostial (caudal tip very indistinct). Distinct rostrum, usually pointed or sharply rounded.

**Key**

- 1a. Rostrum elongate; ostium deep and narrow, lies along rostrum . . . . . *Persparsia kopua* 65.7
- 1b. Rostrum short and tapering; ostium shallow and oval . . . . . 2
- 2a. Otolith shape square to ovate; rostrum small and pointed; dorsal margin of otolith slightly rounded and entire; ventral margin serrate . . . . ?*Sagamichthys* sp. A 65.8A
- 2b. Otolith ovate; rostrum moderate and pointed; dorsal margin rounded and lobed; ventral margin slightly rounded and sinuate . . . . ?*Sagamichthys* sp. B. 65.8B

***Persparsia kopua*, SSF No. 65.7 PLATE 10**

**DISTRIBUTION**: Eastern Atlantic to New Zealand, mostly between 30° and 50°S. Attains 14 cm. **MATERIAL**: 7/8 (1.3-4.6 mm OD, 64-181 mm TL), PEM 13401, 13202, 13269, 13200, 13270, 15358, 13267; Cape west coast; lodged in SAM; Id. PAH.

**Otolith shape**: Ovate. **Thickness**: Thin. **Form**: - Mesial flat to slightly concave, - Lateral slightly convex. **Dorsal margin**: Rounded in small otoliths (c.1.3 mm OD), becoming square or raised and rectangular in large ones (>2 mm); **sculpture**, small entire, becoming irregular to lobed with growth. **Ventral margin**: Slightly rounded, **sculpture** irregular to dentate posteriorly in large otoliths. **Posterior margin**: Straight and irregular to slightly sinuate or lobed. **Sulcus acusticus**: Ostial, pseudo-archaeosulcoid. **Colliculum**: Homomorph, indistinct anterior colliculum. **Pseudocolliculum**: Absent. **Ostium**: Deep in posterior, shallow anteriorly.



only, extending to end of rostrum. **Cauda:** Very poorly defined, tip open. **Ostio-caudal differentiation:** No constrictions. **Collum:** Absent but marked step up to cauda. **Crista superior:** Well developed above ostium, poor to absent over cauda. **Crista inferior:** Ridge-like under ostium, poor to absent under cauda. **Dorsal depression:** Oval and small above dorsal crista. **Ventral depression:** Shallow, towards the end of the rostrum. **Rostrum:** Very prominent, sharply rounded. **Antirostrum:** Broad and rounded but may be absent in small otoliths. **Excisura:** Wide, notch shallow, angle wide to acute.

**?*Sagamichthys schnakenbecki*, SSF No. 65.8**

NOTE: Otoliths from fish collected on the Cape west coast cruise FRS *Africana* 060, identified as this species. Variations between the otoliths suggest there may be two species, therefore they are treated separately here as "A" and "B".

**?*Sagamichthys schnakenbecki* A, SSF No. 65.8A  
PLATE 10**

DISTRIBUTION: Uncertain.

MATERIAL: 1/1 (2.9 mm OD, 225 mm TL), PEM 13331; Cape west coast, lodged in SAM.

**Otolith shape:** Square to ovate. **Thickness:** Thin. **Form:** - Mesial flat, - Lateral slightly convex. **Dorsal margin:** Slightly rounded; **sculpture**, entire. **Ventral margin:** Slightly rounded, irregular and serrate. **Posterior margin:** Slightly rounded, flat to slightly emarginate and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid, cauda indistinct. **Colliculum:** Homomorph, single indistinct anterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Oval, deep towards neck. **Cauda:** Shallow, flared and very poorly defined. **Ostio-caudal differentiation:** Dorsal constriction. **Collum:** Absent, step up to cauda. **Crista superior:** Distinct, ridge-like and curved over anterior ostium, absent over cauda. **Crista inferior:** Ridge-like under the posterior of ostium, poor to absent elsewhere. **Dorsal depression:** Large shallow depression over most of dorsal area. **Ventral depression:** Absent. **Rostrum:** Small and pointed. **Antirostrum:** Short, broad and blunt. **Excisura:** Moderate, notch shallow, angle wide.

**?*Sagamichthys schnakenbecki* B, SSF No. 65.8B  
PLATE 10**

DISTRIBUTION: Uncertain.

MATERIAL: 1/1 (2.5 mm OD, 141 mm TL), PEM 13266; Cape west coast, lodged in SAM.

**Otolith shape:** Ovate. **Thickness:** Thin. **Form:** - Mesial flat, - Lateral slightly convex. **Dorsal margin:** Rounded and lobed; **sculpture**, entire. **Ventral margin:** Slightly rounded, irregular and sinuate. **Posterior margin:** Slightly emarginate and lobed. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Homomorph, single indistinct anterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Deep towards posterior. **Cauda:** Shallow, very poorly defined. **Ostio-caudal differentiation:** Dorsal constriction. **Collum:** Absent, step up to cauda. **Crista superior:** Low ridge over ostium, absent over cauda. **Crista inferior:** Ridge-like under the posterior of ostium, poor to absent elsewhere. **Dorsal depression:** Large, very shallow depression over most of dorsal area. **Ventral depression:** Absent. **Rostrum:** Moderate and pointed. **Antirostrum:** Large, broad and rounded. **Excisura:** Wide, notch moderate, angle wide.

**ORDER STOMIIFORMES**

**GONOSTOMATIDAE Nelson No. 144**

**Family characteristics:** Otoliths usually have elongate rostrum (in some species short) and rounded posterior margin. Generally small (<3 mm OD). Heterosulcoid with pit in cauda.

**Key**

- 1a. Otolith teardrop-shaped; rostrum elongate; cauda with shallow pit . . . . . *Gonostoma elongatum* 74.14
- 1b. Otolith ovate to elliptic or rounded; rostrum not elongate; cauda with deeper pit . . . . . 2
- 2a. Otolith ovate to elliptic with ventral margin flat; ostium short and deep; ventral margin of rostrum flat and depressed . . . . . *Gonostoma bathyphilum* 74.12
- 2b. Otolith elliptic and rounded with ventral margin rounded; ostium shallower; ventral margin of rostrum angled but not depressed . . . . . 3
- 3a. Rostrum short, angular and pointed; antirostrum absent or minute; ostium distinct and flared; crista superior a distinct ridge . . . . . *Bonapartia pedaliota* 74.1
- 3b. Rostrum short and blunt; antirostrum small and rounded; ostium indistinct; crista superior low and ridge-like over caudal pit only . . . . . *Gonostoma atlanticum* 74.11

***Bonapartia pedaliota*, SSF No. 74.1 PLATE 11**

DISTRIBUTION: Oceanic, mesopelagic, subtropical/tropical Atlantic, Gulf of Mexico, Indian Ocean; reported from 19°03'S, 11°27'E by Karrer (1975). Attains c. 75 mm.

MATERIAL: 2/2 (both 1.3 mm OD, TL not recorded), 0363H, 0341H; IOEM; Id. AK.

**Otolith shape:** Elliptic, appears rounded with protruding rostrum. **Thickness:** Thin. **Form:** - Mesial flat, - Lateral slightly convex. **Dorsal margin:** Rounded; **sculpture**, entire. **Ventral margin:** Rounded, entire under posterior, slightly serrate under rostrum. **Posterior margin:** Rounded and entire. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Homomorph, anterior low colliculum, pit in cauda. **Pseudocolliculum:** Absent. **Ostium:** Flared with a rough floor. **Cauda:** Pit in cauda, more shallow towards tip. **Ostio-caudal differentiation:** Marked dorsal, slight ventral, constriction. **Ostium/cauda:** 1:1.5, 1:1.5. **Collum:** Low. **Crista superior:** Ridge-like over cauda, well developed over ostium, poor at tip. **Crista inferior:** Moderately well developed along length of sulcus. **Dorsal depression:** Oval depression above ridge. **Ventral depression:** Absent, margin may be depressed. **Rostrum:** Small, broad and pointed. **Antirostrum:** Minute to absent. **Excisura:** Wide, notch absent.

***Gonostoma atlanticum*, SSF No. 74.11 PLATE 11**

DISTRIBUTION: In tropical/subtropical waters of all oceans; 25°S26'S, 38°11'E and 39°01'S, 20°04'E in this region. Attains 6-7 mm.

MATERIAL: 2/2 (1.0 mm OD = 1723, 3408 broken, 51,65 mm SL), PEM 1723, 3408; Transkei and eastern Cape; Id. PAH.

**Otolith shape:** Elliptic - rounded with slightly elongate rostrum. **Thickness:** Medium thin. **Form:** - Mesial flat to slightly concave, -Lateral convex. **Dorsal margin:** Rounded; **sculpture**, entire. **Ventral margin:** Rounded to slightly irregular. **Posterior margin:** Rounded and entire. **Sulcus acusticus:** Ostial, heterosulcoid, ostium and cauda difficult to distinguish. **Colliculum:** No raised colliculi. **Pseudocolliculum:** Absent. **Ostium:** Shallow, along rostrum (our specimens broken). **Cauda:** Contains pit. **Ostio-caudal differentiation:** Not clear. **Ostium/cauda:** Not measured, broken rostra. **Collum:** Very low collum may be present. **Crista superior:** Ridge-like over caudal pit only. **Crista inferior:** Well developed under caudal pit. **Dorsal depression:** The entire dorsal area is depressed. **Ventral depression:** Shallow, narrow depression under crista. **Rostrum:** Apparently elongated and tapering (broken). **Antirostrum:** Small and rounded. **Excisura:** Probably wide (broken), notch shallow, angle wide.



**Gonostoma bathyphilum, SSF No. 74.12 PLATE 11**

**DISTRIBUTION:** In temperate/subtropical Atlantic and Pacific oceans; off Cape Point and from 33°41'S, 05°54'E. Attains c. 20 cm.

**MATERIAL:** 1/3 (1.25 mm OD, 125 mm SL), PEM 3442; off Transkei; Id. PAH.

**Otolith shape:** Ovate to elliptic. **Thickness:** Medium thin. **Form:** - Mesial slightly concave, - Lateral convex. **Lateral surface:** Two indentations on each side at base of rostrum. **Dorsal margin:** Rounded; **sculpture,** entire. **Ventral margin:** Flat and entire. **Posterior margin:** Rounded and entire. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** No raised colliculi. **Pseudocolliculum:** Absent. **Ostium:** Short, deep and pinched. **Cauda:** Pit-like with narrow, shallow tip to posterior. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:2.3. **Collum:** Wall-like structure. **Crista superior:** Poorly developed. **Crista inferior:** Poorly developed. **Dorsal depression:** Large, triangular shaped. **Ventral depression:** Triangular area on the rostrum. **Rostrum:** Moderate and sharply rounded. **Antirostrum:** Absent. **Excisura:** Moderate, no distinct notch.

**Gonostoma elongatum, SSF No. 74.14 PLATE 11**

**DISTRIBUTION:** In all three major oceans; off Saldanha and from 19°13'-40°S, 10°E-13°W. Attains 275 mm.

**MATERIAL:** 5/12 (1.5-3.4 mm OD, c. 87-235 mm SL), PEM 3473, 1728, 1729, 3443, 13086; Cape west coast and Natal to southeast Cape coast.

**Otolith shape:** Tear-drop. **Thickness:** Thin. **Form:** - Mesial flat, - Lateral flat. **Lateral surface:** Raised nucleus with ridge along middle of rostrum. **Dorsal margin:** Rounded to slightly lobed; **sculpture,** entire. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Rounded, may be lobed, and sculpture entire. **Sulcus acusticus:** Ostial: shallow trough behind caudal tip gives appearance of ostio-caudal opening, heterosulcoid. **Colliculum:** No raised colliculi. **Pseudocolliculum:** Absent. **Ostium:** Narrow, lies along the length of rostrum, may be very indistinct. **Cauda:** May have deep pit, wider but edges poorly defined. **Ostio-caudal differentiation:** Not constricted. **Ostium/cauda:** 1:1.1, 1:1, 1:1.1 (others damaged). **Collum:** Indistinct but there is a slightly raised area between ostium and cauda. **Crista superior:** Absent, except there may be a low ridge over caudal pit. **Crista inferior:** Absent. **Dorsal depression:** Absent. **Ventral depression:** Absent but there is a shallow post-caudal trough. **Rostrum:** Large elongate, tapering to a point. **Antirostrum:** Absent but antero-dorsal wall lobed, rounded and raised behind excisura. **Excisura:** Wide, notch absent.

**STERNOPTYCHIDAE Nelson No. 145**

**Family characteristics:** The different otolith forms found in this family suggest a polyphyletic lineage and that *Maurolicus* belongs to a different family, possibly Photichthyidae. For the purposes of this key, the current status is retained. Otoliths tall or high at least posteriorly with straight or lunate posterior margin. Heterosulcoid and ostial. In the Sternoptychini there is a well developed posterior colliculum, anterior may be developed and fused or absent. In *Maurolicus* there is no raised colliculum and rostrum pointed. *Polyipnus* also has pointed rostrum.

**Key**

- 1a. Otolith approximately triangular or ear-like; pointed or extended rostrum . . . . . 2
- 1b. Otolith tall or discoid; rostrum short, broad and rounded . . . . . 4

- 2a. Otolith approximately triangular; antirostrum absent; posterior margin of otolith approximately straight; crista superior straight ridge over cauda . . . . . *Maurolicus muelleri* 75.1
- 2b. Otolith shape ear-like; antirostrum digit-like; posterior margin of otolith rounded; crista superior absent . . . . . 3
- 3a. Dorsal area larger than ventral area and dorsal corner of otolith more acute than ventral corner; antirostrum elongate . . . . . *Polyipnus indicus* 75.8
- 3b. Dorsal and ventral area similar sized with dorsal and ventral corners of otolith symmetrical; antirostrum short . . . . . *Polyipnus polli* 75.10
- 4a. Otolith discoid, not tall . . . . . *Stemoptyx diaphana* 75.11
- 4b. Otolith tall . . . . . 5
- 5a. Ostium deep, flared anteriorly with no anterior colliculum; posterior colliculum raised and smooth in cauda; caudal tip open . . . . . *Argyropelecus sladeni* 75.7
- 5b. Ostium filled by colliculum with an elongate pit, fused to posterior colliculum; caudal tip closed . . . . . 6
- 6a. Anterior caudal pit elongate; ostium elongate; cauda elongate . . . . . *Argyropelecus affinis* 75.4
- 6b. Anterior caudal pit shorter; ostium short and oval; cauda short . . . . . *Argyropelecus gigas* 75.5

**Maurolicus muelleri, SSF No. 75.1 PLATE 11**

**DISTRIBUTION:** In all oceans, more common in colder regions. Attains c. 6 cm.

**MATERIAL:** 5/90 (1.3-2.0 mm OD, 37-57 mm TL), PEM 14742, 7111, 7121, 7128, 7001 (RUSI 37440), [7003 (RUSI 37441)]; Cape west coast and Namibia; Id. MJS, PCH.

**Otolith shape:** Approximately triangular, small are more rounded. **Thickness:** Medium thin. **Form:** - Mesial flat, - Lateral convex, narrowing to rostrum. **Dorsal margin:** Approximately straight, angled to rostrum; **sculpture,** irregular. **Ventral margin:** Approximately straight, angled to rostrum and irregular. **Posterior margin:** Generally rounded with sharp angles at dorsal and ventral corners, sculpture is slightly irregular. **Sulcus acusticus:** Ostial, archaesulcoid. **Colliculum:** Homomorph, very low, indistinct anterior colliculum. **Pseudocolliculum:** Absent. **Sulcus acusticus:** Anterior half of sulcus is deeper than posterior. **Ostio-caudal differentiation:** No constrictions. **Collum:** Absent. **Crista superior:** Ridge-like and straight along entire sulcus. **Crista inferior:** Absent in anterior of sulcus. In the posterior the ridge is divided into two parts: a short curved one, then a short straight part. **Dorsal depression:** Absent. **Ventral depression:** Absent. **Rostrum:** Prominent, tapering anteriorly to a point. **Antirostrum:** Absent, dorsal wall rises distinctly posterior to excisura. **Excisura:** Wide, notch absent or very shallow.

**Argyropelecus affinis, SSF No. 75.4 PLATE 11**

**DISTRIBUTION:** Once reported from this area, abundant north of 10°S latitude along west African coast and to at least 15°S near Madagascar in Indian Ocean. Widely distributed in all three major oceans. Attains 70 mm.

**MATERIAL:** 1/1 (1.25 mm OD, TL not recorded), PEM 0937; locality unknown; Id. JEF.

**Otolith shape:** Dorso-ventrally oval. **Thickness:** Medium thin. **Form:** - Mesial flat, - Lateral concave. **Dorsal margin:** Domed; **sculpture,** slightly irregular. **Ventral margin:** Keeled and irregular. **Posterior margin:** Gently rounded and slightly irregular. **Sulcus acusticus:** Ostial, may appear ostio-caudal without coating, heterosulcoid. **Colliculum:** Heteromorph, anterior and posterior colliculi raised and fused, with anterior pit. **Pseudocolliculum:** Absent. **Ostium:** With smooth anterior colliculum and a deep,



elongate pit. **Cauda:** Completely filled by smooth posterior colliculum, with slight ventral flexion. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:0.7. **Collum:** Absent. **Crista superior:** Absent. **Crista inferior:** Absent. **Dorsal depression:** Shallow depression above ostium, and a distinct trough along entire sulcus, reaching margins. **Ventral depression:** Shallow, below the ostium. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Small, notch absent.

#### *Argyropelecus gigas*, SSF No. 75.5 PLATE 11

**DISTRIBUTION:** Common in this area, particularly west of 20°E and to 40°S, southeast of Cape of Good Hope, Indian Ocean to 40°S and in South Atlantic to 38°S; also reported from the Pacific. Exceeds 110 mm.

**MATERIAL:** 2/3 (1.8, 2.15 mm OD, 85, c. 90 mm SL), PEM 13132, 12055; Cape west coast; lodged in SAM.

**Otolith shape:** Dorso-ventrally oval. **Thickness:** Medium thin. **Form:** - Mesial slightly concave, - Lateral slightly convex. **Dorsal margin:** Domed; **sculpture,** irregular. **Ventral margin:** Keeled and entire, becoming irregular in larger otoliths. **Posterior margin:** Straight, may be indented, **sculpture** slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior and posterior colliculi raised and fused with anterior pit. **Pseudocolliculum:** Absent. **Ostium:** Contains smooth anterior colliculum with elongated pit. **Cauda:** Filled by smooth posterior colliculum, with ventral flexion. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:0.8, 1:0.8. **Collum:** Absent. **Crista superior:** Ridge-like along length of sulcus. **Crista inferior:** Absent. **Dorsal depression:** No depression, but trough runs along entire sulcus, not quite reaching posterior margin. **Ventral depression:** Absent. **Rostrum:** Short and broad. **Antirostrum:** Absent to minute. **Excisura:** Small, notch within excisura absent.

#### *Argyropelecus sladeni*, SSF No. 75.7 PLATE 11

**DISTRIBUTION:** Probably limited in this area to west of 20°E. Worldwide; reported to 12°S in Indian Ocean. Seldom exceeds 60 mm.

**MATERIAL:** 2/2 (0.95, 1.5 mm OD, 0261H 43.5 mm TL, 0939 not recorded), 0261H, PEM 0939; locality not recorded; Id. AK, JEF.

**Otolith shape:** Dorso-ventrally oval. **Thickness:** Medium thin. **Form:** - Mesial slightly concave, - Lateral slightly convex. **Dorsal margin:** Dome-shaped; **sculpture,** slightly irregular. **Ventral margin:** Keeled and entire. **Posterior margin:** Approximately straight and entire. **Sulcus acusticus:** Ostial, but in uncoated otoliths may appear ostio-caudal, heterosulcoid. **Colliculum:** Heteromorph, single smooth colliculum in cauda only. **Pseudocolliculum:** Absent. **Ostium:** Deep, flared ventrally. **Cauda:** Filled by smooth posterior colliculum, with ventral flexion, tip not closed. **Ostio-caudal differentiation:** Ventral constriction. **Ostium/cauda:** 1:1.4, 1:1.5. **Collum:** Absent, distinct step up to cauda. **Crista superior:** Absent over ostium, well developed to ridge-like over cauda. **Crista inferior:** Absent. **Dorsal depression:** Absent, shallow trough above sulcus. **Ventral depression:** Slight depression below cauda. **Rostrum:** Short, broad and rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Moderate, notch very shallow and wide.

#### *Polyipnus indicus*, SSF No. 75.8 PLATE 11

**DISTRIBUTION:** Mesopelagic; distribution not well documented; known only from east African coast from 30°S to 5°N latitude. Attains 7 mm SL.

**MATERIAL:** 2/2 (2.65, 3.0 mm OD, 3486 = 45 mm SL, 14914 = 46 mm TL), PEM 3486 (SAM 28717), 14914 (RUSI 35518); Cape south coast and Transkei; Id. MEA and PAH.

**Otolith shape:** Posteriorly lunate, ear-like in appearance. **Thickness:** Moderately thick. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Crested; **sculpture,** entire. **Ventral margin:** Slightly rounded to flattened and entire. **Posterior margin:** Lunate and entire. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph with single, raised, rod-like posterior colliculum in cauda. **Pseudocolliculum:** Absent. **Ostium:** Small, flared with a rough floor confined to antero-dorsal part of rostrum. **Cauda:** Ventral margin horizontal below colliculum, dorsal margin indistinct. **Ostio-caudal differentiation:** Slight ventral constriction. **Ostium/cauda:** 1:1.2, (3486 broken). **Collum:** Absent. **Crista superior:** Absent. **Crista inferior:** Low ridge-like along entire sulcus acusticus. **Dorsal depression:** Large, deep depression above cauda, a posterior depression close to margin, lunate in shape. **Ventral depression:** Large depression below cauda and small one below ostium may be present. **Rostrum:** Narrow and pointed. **Antirostrum:** Large, digit-like and sharply rounded. **Excisura:** Moderate, notch deep, angle acute.

#### *Polyipnus polli*, SSF No. 75.10 PLATE 12

**DISTRIBUTION:** Eastern Atlantic continental margins from Gulf of Guinea to at least 25°S. Seldom exceeds 50 mm SL.

**MATERIAL:** 1/1 (otolith damaged, 20 mm SL), 0260H; locality unknown; Id. AK.

**Otolith shape:** Posteriorly lunate, ear-like in shape. **Thickness:** Moderately thick. **Form:** - Mesial slightly concave, - Lateral very convex. **Dorsal margin:** Crested and round; **sculpture,** entire. **Ventral margin:** Keeled and entire. **Posterior margin:** Lunate and slightly lobed. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, a single rod-like posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Floor rough, confined to anterior dorsal part of rostrum. **Cauda:** Contains the raised, rod-like colliculum, margins are indistinct. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** Rostrum damaged. **Collum:** Absent, slight step present. **Crista superior:** Absent. **Crista inferior:** Absent. **Dorsal depression:** Small, circular hollow above cauda. **Ventral depression:** Small, circular hollow below cauda, there is a second shallow depression at the base of the rostrum. **Rostrum:** Small but rostrum is broken in our specimen. **Antirostrum:** Small and rounded. **Excisura:** Moderate, notch shallow, angle acute.

#### *Sternoptyx diaphana*, SSF No. 75.11 PLATE 12

**DISTRIBUTION:** Oceanic, in this area, primarily east of 30°E and north of 35°S; rare in Atlantic part of this region; worldwide in tropical and temperate seas. Seldom exceeds 50 mm SL.

**MATERIAL:** 2/2 (0.65, 0.7 mm OD, 29, c. 34 mm SL), PEM 1740, 3390; northern Natal and southeast Cape; Id. PAH.

**Otolith shape:** Discoid. **Thickness:** Moderately thin. **Form:** - Mesial slightly concave, - Lateral slightly convex. **Dorsal margin:** Rounded; **sculpture,** entire. **Ventral margin:** Rounded and entire. **Posterior margin:** Rounded and entire. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, a single, smooth posterior colliculum is present. **Pseudocolliculum:** Absent. **Ostium:** Deep, flared with floor uneven. **Cauda:** Filled with a smooth colliculum, there is a slight ventral flexion, tip not closed. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1, 1:1. **Collum:** Absent. **Crista superior:** Absent. **Crista inferior:** Absent. **Dorsal depression:** Absent. **Ventral depression:** Absent. **Rostrum:** Short, broad and rounded. **Antirostrum:** Minute, broad and rounded. **Excisura:** Moderate, notch shallow and angle wide.



## PHOTICHTHYIDAE Nelson No. 146

**Family characteristics:** Otoliths moderate in size, up to 6 mm OD, broad posteriorly, narrow rostral tip. Sulcus heterosulcoid, flared posteriorly with straight cauda.

### Key

- 1a. Dorsal margin flat or slightly rounded; rostrum ventral margin serrate; antirostrum small or rounded; crista superior a low ridge . . . . *Photichthys argenteus* 73.4
- 1b. Dorsal margin flat and angular; rostrum ventral margin irregular; antirostrum absent; crista superior a well developed and distinct ridge . . *Vinciguerria lucetia* 73.-

### *Photichthys argenteus*, SSF No. 73.4 PLATE 12

**DISTRIBUTION:** All three major oceans; southeast Atlantic, southeast of Cape Agulhas and off Natal coast. Attains 30 cm.

**MATERIAL:** 4/66 (3.6-5.6 mm OD, 188-251 mm TL), PEM 14064, 13673, 9017 (RUSI 37480), 13669, [9016-9019 (RUSI 37480)]; Cape west coast; Id. MJS, PCH.

**NOTE:** Otoliths delicate - most rostral tips broken.

**Otolith shape:** Tear-drop. **Thickness:** Thin. **Form:** - Mesial flat, -Lateral flat. **Dorsal margin:** Flattened; **sculpture**, slightly irregular. **Ventral margin:** Shape is rounded in posterior, straight to rostral tip, **sculpture** is slightly irregular posteriorly, serrate under rostrum. **Posterior margin:** Angular postero-dorsal wall, becoming rounded in mid posterior area, **sculpture** slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Homomorph, single colliculum in ostium and cauda, depressed in centre, raised at edge. **Pseudocolliculum:** Absent. **Ostium:** Flared onto rostrum. **Cauda:** Straight and narrow, floor continuous with ostium. **Ostio-caudal differentiation:** Dorsal constriction. **Ostium/cauda:** 1:1 (14064), rest damaged. **Collum:** Absent, no step present. **Crista superior:** Well developed in anterior, ridge-like over the anterior caudal region. **Crista inferior:** Well developed in anterior, becoming less developed towards posterior. **Dorsal depression:** Area flat, shallow depression around posterior of cauda. **Ventral depression:** Raised plateau below sulcus with depression anterior to it. **Rostrum:** Elongate, tapering and pointed. **Antirostrum:** Small and rounded. **Excisura:** Wide, notch very shallow, angle varies.

### *Vinciguerria lucetia*, Garman, 1899 SSF No. 73.- PLATE 12

**DISTRIBUTION:** Eastern Pacific, not yet recorded in this region. **MATERIAL:** 1/1 (1.75 mm OD, TL not recorded), PEM 0532; off Mexico; Id. JEF.

**Otolith shape:** Ovate. **Thickness:** Medium thin. **Form:** - Mesial slightly convex, - Lateral flat. **Dorsal margin:** Flat, anterior and posterior corners are angular; **sculpture**, slightly lobed. **Ventral margin:** Rounded and irregular. **Posterior margin:** Corners angular and shape irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** No raised colliculi. **Pseudocolliculum:** Absent. **Ostium:** Small, flared anteriorly and lies along the length of the rostrum. **Cauda:** Straight and horizontal, has a deep anterior pit. **Ostio-caudal differentiation:** Ostium generally narrower than cauda, slight ventral constriction. **Ostium/cauda:** 1:1.3. **Collum:** Low wall-like structure between the ostium and cauda. **Crista superior:** Straight and ridge-like over cauda only, absent at tip. **Crista inferior:** Straight and ridge-like under the cauda only. **Dorsal depression:** Large oval depression covering most of dorsal area. **Ventral depression:** Absent but raised plateau under crista. **Rostrum:** Large and pointed. **Antirostrum:** Minute but dorsal wall rises vertically behind excisura. **Excisura:** Wide, notch absent or very shallow.

## CHAULIODONTIDAE Nelson No. 147

**Family characteristics:** Otoliths minute (<2 mm), oval to discoid with archaesulcoid sulcus. Homomorph, fused colliculum with anterior slit and posterior small pits. Two species described here very difficult to distinguish using otoliths, no key provided. Otoliths very similar to Stomiidae.

### *Chauliodus minimus*, SSF No. 68.1 PLATE 12

**DISTRIBUTION:** Taken offshore in the Atlantic; South Atlantic between 7° and 40°S. Attains 14.5 cm.

**MATERIAL:** 1/1 (1.2 mm OD, 219 mm TL), PEM 14754; Cape west coast, lodged in SAM; Id. MJS.

**Otolith shape:** Discoid. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly convex. **Lateral surface:** Shallow pit at nucleus. **Dorsal margin:** Rounded; **sculpture**, entire. **Ventral margin:** Rounded and entire. **Posterior margin:** Rounded and entire. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Homomorph, single fused colliculum in ostium and cauda. **Pseudocolliculum:** Absent. **Ostium:** Elongate, very deep groove with dorsal flexion. **Cauda:** With deep and elongate pit. **Ostio-caudal differentiation:** Slight dorsal constriction. **Ostium/cauda:** 1:0.6. **Collum:** Wall-like confluent with top of cristae. **Crista superior:** Absent. **Crista inferior:** Poorly developed or absent. **Dorsal depression:** Crescentic, curves around posterior of cauda. **Ventral depression:** Absent. **Rostrum:** Very short, broad and rounded. **Antirostrum:** Absent. **Excisura:** Narrow, no notch.

### *Chauliodus sloani*, SSF No. 68.2 PLATE 12

**DISTRIBUTION:** Taken offshore off southern African coasts. Circumglobal between 50°N and 50°S. Attains more than 30 cm.

**MATERIAL:** 8/24 (0.75-1.5 mm OD, 149-263 mm SL), PEM 1734, 14915 (RUSI 35602), 13679, 13681, 13676, 3400, 13787, 14919 (RUSI 35602); Cape west coast and southeast coast; Id. PAH, MJS, MEA.

**Otolith shape:** Discoid. **Thickness:** Medium thin. **Form:** - Mesial slightly convex, - Lateral slightly convex. **Lateral surface:** Shallow pit at nucleus. **Dorsal margin:** Rounded; **sculpture**, entire. **Ventral margin:** Rounded and entire. **Posterior margin:** Rounded and entire. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Homomorph, single fused colliculum in ostium, completely fills cauda. **Pseudocolliculum:** Absent. **Ostium:** Deep, slightly flared anteriorly, colliculum with pit or slit. **Cauda:** Infilled by colliculum, with 2-3 small, deep pits. **Ostio-caudal differentiation:** Slightly constricted dorsally. **Ostium/cauda:** all c. 1:0.7. **Collum:** Steep on ostial side. **Crista superior:** Absent. **Crista inferior:** Poorly developed to absent. **Dorsal depression:** Crescentic, curving around posterior of cauda. **Ventral depression:** Narrow deep trough below colliculum. **Rostrum:** Broad, minute and rounded. **Antirostrum:** Minute and rounded. **Excisura:** Narrow, no notch.

## STOMIIDAE Nelson No. 148

**Family characteristics:** Based on the single species. Otoliths minute, and rounded with pit in low, fused colliculum. Otoliths similar to Chauliodontidae.

### *Stomias boa boa*, SSF No. 67.2 PLATE 12

**DISTRIBUTION:** Taken offshore off southern Africa. Circumglobal between about 20° and 45°S; a separate population in Mediterranean Sea and off northwest Africa. Attains more than 30 cm.

**MATERIAL:** 3/3 (0.7-1.2 mm OD, 152-245 mm TL), PEM 14918 (RUSI 35523), 14727, 13199; Cape south and west coasts; Id. PAH, MEA.



**Otolith shape:** Circular and minute. **Thickness:** Moderately thin. **Form:** - Mesial flat, - Lateral slightly convex. **Dorsal margin:** Rounded; **sculpture,** entire. **Ventral margin:** Rounded and entire. **Posterior margin:** Rounded and entire. **Sulcus acusticus:** Ostial, archaesusulcoid. **Colliculum:** Homomorph, single fused colliculum in ostium and cauda. **Pseudocolliculum:** Absent. **Ostium and cauda:** Not distinguishable, sulcus horizontal, deep pit variably placed in colliculum. **Ostio-caudal differentiation:** No constrictions. **Collum:** Absent. **Crista superior:** Absent. **Crista inferior:** Low ridge along sulcus length. **Dorsal depression:** Rounded area in anterior. **Ventral depression:** Absent. **Rostrum:** Minute and rounded. **Antirostrum:** Minute and rounded or absent. **Excisura:** Narrow, notch absent.

#### ASTRONESTHIDAE Nelson No. 149

**Family characteristics:** Otoliths small (<3 mm), ovate, heterosulcoid, ostial with deeper ostium than cauda, with post-caudal trough. NOTE: Family currently under revision.

##### Key

- 1a. Otolith tall to ovate or hour-glass shaped . . . . . 2
- 1b. Otolith ovate, not tall . . . . . 3
- 2a. Otolith tall ovate; posterior margin slightly rounded and slightly oblique; ostium horizontal but flared dorsally; rostrum short and sharply rounded . . . . .  
*Borostomias mononema* 69.8
- 2b. Otolith hour-glass shaped; posterior margin emarginate; ostium flexed ventrally on rostrum; rostrum short, broad and rounded . . . . . *Neonesthes capensis* 69.9
- 3a. Ventral margin with step-like depression; no distinct depression posterior to caudal tip . . . . .  
*Astronesthes boulengeri* 69.1
- 3b. Ventral margin depression not step-like; depression posterior to caudal tip . . . . *Astronesthes indicus* 69.3

#### *Astronesthes boulengeri*, SSF No. 69.1 PLATE 12

**DISTRIBUTION:** Circumglobal between 30° and 40° S. Attains 21 cm.

**MATERIAL:** 2/2 (2.6, 2.7 mm OD, 237, 249 mm TL), PEM 13301, 13302; Cape west coast; Id. PCH, lodged in SAM.

**Otolith shape:** Ovate. **Thickness:** Thin. **Form:** - Mesial flat, - Lateral flat. **Dorsal margin:** Rounded; **sculpture,** slightly irregular. **Ventral margin:** Flatter than dorsal surface, slightly irregular. **Posterior margin:** Rounded, may be indented. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** No raised colliculi. **Pseudocolliculum:** Absent. **Ostium:** Deep, flared dorsally. **Cauda:** Horizontal and narrow. **Ostio-caudal differentiation:** Dorsally constricted. **Ostium/cauda:** 1:0.9, 1:1.5. **Collum:** Definite wall-like structure. **Crista superior:** Well developed over the ostium and neck, poor over cauda. **Crista inferior:** Narrow, rough ridge under cauda, poor under ostium. **Dorsal depression:** Absent. **Ventral depression:** Margin distinctly depressed, post-caudal depression present. **Rostrum:** Moderate, broad and rounded or sharply rounded. **Antirostrum:** Absent but dorsal margin bulges above ostium. **Excisura:** Wide, notch very shallow and very wide.

#### *Astronesthes indicus*, SSF No. 69.3 PLATE 12

**DISTRIBUTION:** Circumglobal in tropical waters, taken between 33° and 35° south on Atlantic side but not yet south of 20° S on the east coast of southern Africa. Attains 18 cm.

**MATERIAL:** 3/4 (1.2-2.4 mm OD, 106-225 mm SL), PEM 13300, 13298, 13297; Cape west coast; lodged in SAM.

**Otolith shape:** Ovate. **Thickness:** Thin. **Form:** - Mesial slightly convex, - Lateral flat. **Lateral surface:** Slight depression at nucleus. **Dorsal margin:** Rounded to domed; **sculpture,** slightly

irregular. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Rounded, may be slightly indented and entire. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** No raised colliculi. **Pseudocolliculum:** Absent. **Ostium:** Flared dorsally, deeper than the cauda. **Cauda:** Straight, may have shallow pit, tip indistinct, abuts a posterior trough. **Ostio-caudal differentiation:** Slight dorsal constriction. **Ostium/cauda:** 1:1.2, 1:1.2, 1:1.2. **Collum:** Usually present either narrow or broad, low wall-like structure. **Crista superior:** Ridge-like in anterior, well developed towards posterior. **Crista inferior:** A narrow ridge under the cauda, poorly developed in anterior and at posterior tip. **Dorsal depression:** Dorsal area undulating and depressed. **Ventral depression:** Narrow, under the ridge, may join posterior trough. **Rostrum:** Moderate, broad and sharply rounded. **Antirostrum:** Minute and rounded, may be absent. **Excisura:** Moderately wide, notch very shallow, angle wide.

#### *Borostomias mononema*, SSF No. 69.8 PLATE 13

**DISTRIBUTION:** Reported from Atlantic coast of southern Africa at 28° S and from Indian Ocean to about 25° S. Mainly in tropical waters of Atlantic and Indian oceans. Attains 31 cm.

**MATERIAL:** 1/1 (2.1 mm OD, 303 mm TL), PEM 13272; Cape west coast; lodged in SAM.

**Otolith shape:** Tall and ovate. **Thickness:** Thin. **Form:** - Mesial flat, - Lateral slightly convex. **Dorsal margin:** Raised; **sculpture,** slightly lobed. **Ventral margin:** Rounded and slightly lobed. **Posterior margin:** Straight and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** No raised colliculi. **Pseudocolliculum:** Absent. **Ostium:** Flared dorsally and deeper than cauda. **Cauda:** Straight, horizontal shallow with shallow pits. **Ostio-caudal differentiation:** Slight dorsal constriction. **Ostium/cauda:** 1:1.3. **Collum:** Absent, step up to cauda. **Crista superior:** Well developed along the length of the sulcus. **Crista inferior:** Ridge-like under cauda, poorly developed under ostium. **Dorsal depression:** Dorsal area undulating with one depression near sulcus and one near margin; posterior trough at tip of cauda. **Ventral depression:** Area immediately below crista is raised, crescentic depression close to margin. **Rostrum:** Broad, short and sharply rounded. **Antirostrum:** Minute and slightly pointed. **Excisura:** Moderate, notch shallow, angle wide.

#### *Neonesthes capensis*, SSF No. 69.9 PLATE 13

**DISTRIBUTION:** Eastern and southern parts of this area. Sub-tropical/temperate waters of all oceans, but appears to be rare or absent in tropical waters. Attains 17 cm.

**MATERIAL:** 4/9 (1.8-1.9 mm OD, 140-159 mm SL), PEM 13397, 3470, 13395, 13382; Cape west coast and off Natal; lodged in SAM.

**Otolith shape:** Discoid to hour-glass. **Thickness:** Moderately thin. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Domed; **sculpture,** entire. **Ventral margin:** Rounded and entire to slightly irregular. **Posterior margin:** Rounded or slightly indented and entire. **Sulcus acusticus:** Ostial, may appear ostio-caudal, heterosulcoid. **Colliculum:** No raised colliculi. **Pseudocolliculum:** Absent. **Ostium:** Deeper depression, with slight ventral flexion. **Cauda:** Shallower, approximately straight, floor uneven but not raised. **Ostio-caudal differentiation:** Slight ventral constriction. **Ostium/cauda:** 1:1.1, 1:1, 1:0.9, 1:1.25. **Collum:** Absent. **Crista superior:** Ridge-like along length of sulcus, less developed in smaller otoliths. **Crista inferior:** Uneven ridge along the length of the sulcus. **Dorsal depression:** Large, shallow depression. A small posterior depression is present behind the caudal tip. **Ventral depression:** Groove under crista under which there is a raised plateau. **Rostrum:** Short, broad and rounded. **Antirostrum:** Absent. **Excisura:** Moderate, notch very shallow, angle wide.



## MELANOSTOMIIDAE Nelson No. 150

NOTE: Considerable variation was found in the otoliths of species in this family. Because it is currently being revised, these identifications should be treated with caution.

**Family characteristics:** Otoliths approximately discoid or circular and small (<2 mm OD). Sulcus either pit-like or narrow and flaring anteriorly and usually ostial.

### Key

- 1a. Sulcus pit-like, archaesusulcoid . . . . . 2
- 1b. Sulcus narrow or slit-like, heterosulcoid . . . . . 3
- 2a. Rostrum and antirostrum minute; excisural notch absent; sulcus a shallow and oval pit . . . . . *Eustomias lipochirus* 72.10
- 2b. Rostrum and antirostrum small; excisural notch shallow; sulcus with deep, rounded pit in posterior . . . . . *Eustomias schmidtii* 72.11
- 3a. Sulcus narrow, deep, and slit-like; ostium slightly flared . . . . . *Opostomias micripnus* 72.21
- 3b. Sulcus narrow or shallow and slit-like; ostium not differentiated from cauda . . . . . 4
- 4a. Antirostrum broad and rounded; excisural notch shallow, sulcus shallow . . . . . *Echiostoma barbatum* 72.6
- 4b. Antirostrum absent or minute and rounded; excisural notch absent or, if excisural notch shallow, ostium deep . . . . . 5
- 5a. Ventral depression absent; ostium elongate, slightly flared and deep . . . . . *Melanostomias niger* 72.18
- 5b. Ventral area depressed; ostium short, flared and moderately shallow . . . *Trigonolampa miriceps* 72.25

### *Echiostoma barbatum*, SSF No. 72.6 PLATE 13

**DISTRIBUTION:** Southeast of Algoa Bay and off Cape Town; widespread in tropical/subtropical waters of all oceans. Attains 37 cm.

**MATERIAL:** 5/8 (1.05-1.6 mm OD, 1731 = 132 mm SL, 14159 = 243 mm TL), PEM 1731, 14160 (RUSI 28286), 13195, 13372, 14159 (RUSI 28285); Cape west and southeast coasts; Id. MJS, MEA.

**Otolith shape:** Approximately discoid. **Thickness:** Thin. **Form:** - Mesial flat, - Lateral slightly convex. **Dorsal margin:** Rounded; sculpture, entire or slightly irregular. **Ventral margin:** Rounded and entire. **Posterior margin:** Rounded and slightly irregular. **Sulcus acusticus:** Ostial, archaesusulcoid. **Colliculum:** No colliculi visible. **Pseudocolliculum:** Absent. **Ostium and cauda:** Undifferentiated, anterior of sulcus slightly flared and deepens at margin. Posteriorly sulcus narrower and straight. **Ostio-caudal differentiation:** Absent. **Collum:** Absent. **Crista superior:** Poorly developed, absent posteriorly. **Crista inferior:** Well developed along entire sulcus length. **Dorsal depression:** Absent, but there may be a shallow posterior depression. There may be shallow pits close to dorsal margin. **Ventral depression:** Absent. **Rostrum:** Small and slightly pointed. **Antirostrum:** Minute and rounded. **Excisura:** Moderate, notch shallow, angle wide.

### *Eustomias lipochirus*, SSF No. 72.10 PLATE 13

**DISTRIBUTION:** Collected only southwest of Cape of Good Hope; tropical/subtropical Atlantic; one record from western Indian Ocean. Attains 24 cm.

**MATERIAL:** 1/1 (1.1 mm OD, 286 mm TL), PEM 13347; Cape west coast; lodged in SAM.

**Otolith shape:** Circular. **Thickness:** Medium thick. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Rounded; sculpture, entire. **Ventral margin:** Rounded and entire. **Posterior**

**margin:** Rounded and entire. **Sulcus acusticus:** Ostial, opening indistinct, archaesusulcoid. **Colliculum:** No raised colliculi, pit present. **Pseudocolliculum:** Absent. **Ostium and cauda:** Undifferentiated, oval shallow and pit-like. **Ostio-caudal differentiation:** No constrictions. **Collum:** Absent. **Crista superior:** Absent. **Crista inferior:** Narrow ridge along entire length of sulcus. **Dorsal depression:** Absent. **Ventral depression:** Absent. **Rostrum:** Minute, rounded. **Antirostrum:** Minute, rounded. **Excisura:** Narrow, notch absent.

### *Eustomias schmidtii*, SSF No. 72.11 PLATE 13

**DISTRIBUTION:** Off Cape Town; occurs widely in all three major oceans. Attains 21 cm.

**MATERIAL:** 1/1 (0.8 mm OD, 169 mm TL), PEM 14916 (RUSI 35522); Cape south coast; Id. MEA.

**Otolith shape:** Discoid. **Thickness:** Moderately thin. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Rounded; sculpture, entire. **Ventral margin:** Slightly rounded and irregular. **Posterior margin:** Rounded and entire. **Sulcus acusticus:** Ostial, archaesusulcoid. **Colliculum:** No raised colliculi, pit present. **Pseudocolliculum:** Absent. **Ostium and cauda:** Undifferentiated, anterior sulcus shallower, deep rounded pit in posterior. **Ostio-caudal differentiation:** No constrictions. **Collum:** Absent. **Crista superior:** Poorly developed along entire sulcus. **Crista inferior:** Poorly developed anteriorly, low ridge in posterior to tip. **Dorsal depression:** Shallow, joined posteriorly to ventral depression, forming a shallow horse-shoe shape. **Rostrum:** Short, broad and rounded. **Antirostrum:** Short, broad and rounded. **Excisura:** Narrow, notch shallow, angle wide.

### *Melanostomias niger*, SSF No. 72.18 PLATE 13

**DISTRIBUTION:** Widespread in South Atlantic between 20° and 50°S; also Pacific, south of about 30°S, not yet reported from Indian Ocean. Attains 26 cm.

**MATERIAL:** 4/5 (1.05-1.4 mm OD, 12054 = 178 mm SL, 13273 = 287 mm TL), PEM 12054, 12053, 15363 (RUSI 38318), 13273, [15362 (RUSI 38318)]; Cape west coast; Id. MEA. NOTE: Great variation in otolith form suggests that there may be problems with material identified as this species.

**Otolith shape:** Approximately circular, but slightly flattened. **Thickness:** Medium thin. **Form:** - Mesial flat, - Lateral slightly convex. **Lateral surface:** Slightly raised nucleus with groove to margin (except 13273 which has bulge to margin). **Dorsal margin:** Rounded; sculpture, entire to slightly irregular. **Ventral margin:** Rounded to slightly irregular. **Posterior margin:** Rounded to slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** No raised colliculi. **Pseudocolliculum:** Absent. **Ostium:** Moderately deep, flared anteriorly. **Cauda:** Shallow, oval shaped depression (except 13273). **Ostio-caudal differentiation:** Slight dorso-ventral narrowing. **Ostium/cauda:** 1:0.8, 1:0.4, 1:0.9, 1:0.9. **Collum:** Present, except for 13273. **Crista superior:** Absent. **Crista inferior:** Present, slight ridge towards the posterior. **Dorsal depression:** From mid-ostium to above the cauda. **Ventral depression:** Absent. **Rostrum:** Minute and rounded (bulges more in 13273). **Antirostrum:** Absent. **Excisura:** Moderate, notch absent.

### *Opostomias micripnus*, SSF No. 72.21 PLATE 13

**DISTRIBUTION:** Occurs across the Atlantic, Pacific and probably the Indian Ocean south of c. 33°S. Attains c. 50 cm.

**MATERIAL:** 1/1 (1.5 mm OD, 270 mm TL), PEM 13194; Cape west coast; lodged in SAM.

**Otolith shape:** Discoid. **Thickness:** Moderately thin. **Form:** - Mesial convex, - Lateral flat. **Lateral surface:** Slightly raised nucleus, slight depression under ostium. **Dorsal margin:**

Rounded; **sculpture**, entire. **Ventral margin**: Rounded, may have a single notch, entire. **Posterior margin**: Rounded and entire. **Sulcus acusticus**: Ostial, heterosulcoid. **Colliculum**: No colliculi visible. **Pseudocolliculum**: Absent. **Ostium**: Very deep and flared. **Cauda**: Straight and narrow. **Ostio-caudal differentiation**: Dorso-ventrally constricted. **Ostium/cauda**: 1:1.4. **Collum**: Absent. **Crista superior**: Well developed, sulcus deep. **Crista inferior**: Well developed, sulcus deep. **Dorsal depression**: Absent but area raised and uneven, drops away to margin. **Ventral depression**: Area raised below sulcus, drops away to margin. **Rostrum**: Small, broad and rounded. **Antirostrum**: Absent. **Excisura**: Moderate, notch shallow, angle wide.

#### *Trigonolampa miriceps*, SSF No. 72.25 PLATE 13

**DISTRIBUTION**: Off the west coast, apparently circumglobal in Southern Ocean south of 30°S; also in North Atlantic. Attains 32 cm.

**MATERIAL**: 1/1 (1.5 mm OD, 154 mm SL), PEM 7965; North Atlantic; Id. PAH.

**Otolith shape**: Discoid with antero-ventral bulge. **Thickness**: Thin. **Form**: - Mesial flat, - Lateral slightly convex. **Dorsal margin**: Rounded; **sculpture**, entire. **Ventral margin**: More flattened than dorsal, entire to slightly irregular. **Posterior margin**: Rounded and entire. **Sulcus acusticus**: Ostial, heterosulcoid. **Colliculum**: No raised colliculi. **Pseudocolliculum**: Absent. **Ostium**: Flared and deep. **Cauda**: Narrow and horizontal, depressed. **Ostio-caudal differentiation**: Dorsally constricted. **Ostium/cauda**: 1:1.4. **Collum**: Present as a wall-like structure between ostium and cauda. **Crista superior**: Well developed over ostium and collum, absent towards posterior. **Crista inferior**: A broad ridge-like structure along sulcus except in collum area. **Dorsal depression**: Above caudal tip, around posterior of sulcus and joining **ventral depression** which covers most of ventral area except for a raised area immediately below sulcus. **Rostrum**: Small, broad and rounded. **Antirostrum**: Either absent or minute and rounded. **Excisura**: Moderate, notch very shallow, angle wide.

### MALACOSTEIDAE Nelson No. 151

**Family characteristics**: Based on one species, otoliths small (<2 mm OD), thick, discoid with deep, narrow sulcus.

#### *Malacosteus niger*, SSF No. 71.4 PLATE 13

**DISTRIBUTION**: Tropical and subtropical waters of all three major oceans and Atlantic north to subarctic waters. Attains 24 cm.

**MATERIAL**: 5/5 (0.9-1.3 mm OD, 3451 = c. 100 mm SL, 13141 = 158 mm TL), PEM 3451 (SAM 28704), 3387 (SAM 28703), 13140, 13141, 13139; Cape west coast, Transkei and Natal; lodged in SAM. **NOTE**: The differences between these otoliths suggest that more than one species may be represented in this material, or that it is very variable.

**Otolith shape**: Discoid. **Thickness**: Moderately thick. **Form**: - Mesial convex, - Lateral convex. **Dorsal margin**: Rounded; **sculpture**, usually entire. **Ventral margin**: Rounded and slightly irregular or entire. **Posterior margin**: Rounded, often with indentation, and entire. **Sulcus acusticus**: Ostial, smallest appears to be mesial, heterosulcoid. **Colliculum**: No raised colliculi. **Pseudocolliculum**: Absent. **Ostium**: Flared and deep floor of ostium may form a protruding lip. **Cauda**: Straight and narrow slit. **Ostio-caudal differentiation**: Slight ventral constriction. **Ostium/cauda**: 3451 no ratio, 1:2.7, 1:3, 1:1.4, 1:1.7. **Collum**: Absent. **Crista superior**: Well developed and irregular. **Crista inferior**: Well developed and irregular anteriorly, absent posteriorly. **Dorsal depression**: Absent. **Ventral depression**: Deep irregular groove present, no depression. **Rostrum**: Small and

rounded or sharply rounded. **Antirostrum**: Minute and rounded. **Excisura**: Moderate, notch shallow and angle wide.

### IDIACANTHIDAE Nelson No. 152

**Family characteristics**: Otoliths small (<2 mm), oval, archaesusulcoid, homomorph with anterior slit or pit. Difficult to distinguish between species, no key provided.

#### *Idiacanthus atlanticus*, SSF No. 70.1 PLATE 14

**DISTRIBUTION**: Off west (24-37°S) and east (30-41°S) coasts; in 300-500m. Circumglobal between about 26°S and Subtropical Convergence, with northern extensions in eastern boundary currents. Attains more than 43 cm.

**MATERIAL**: 5/5 (0.5-1.4 mm OD, 1737 = 212 mm SL, 13474 = 450 mm TL), PEM 1737, 1738, 14917 (RUSI 35525), 3485, 13474; Cape west coast, Transkei and eastern Cape; Id. PAH.

**Otolith shape**: Oval. **Thickness**: Moderately thin. **Form**: - Mesial flat, - Lateral convex. **Dorsal margin**: Rounded; **sculpture**, entire. **Ventral margin**: Rounded and entire. **Posterior margin**: Rounded and entire. **Sulcus acusticus**: Ostial, archaesusulcoid. **Colliculum**: Homomorph, single colliculum with elongate slit anteriorly. **Pseudocolliculum**: Absent. **Ostium and cauda**: indistinguishable, sulcus has a deep elongated trough anteriorly (more extended in larger otoliths), with posterior filled with colliculum, tip indistinct. **Ostio-caudal differentiation**: Not constricted. **Collum**: Absent. **Crista superior**: Absent. **Crista inferior**: Absent. **Dorsal depression and ventral depression**: Continuous around posterior of sulcus. Grooves on dorsal and ventral side of sulcus. **Rostrum**: Minute, shape of tip varies. **Antirostrum**: Usually absent. **Excisura**: Narrow, notch absent.

#### *Idiacanthus fasciola*, SSF No. 70.2 PLATE 14

**DISTRIBUTION**: Off east coast and in Agulhas water pockets in eastern South Atlantic (34-36°S). Tropical/subtropical waters of North Atlantic, Indian and Pacific oceans. Attains more than 27 cm.

**MATERIAL**: 3/4 (0.7-0.8 mm OD, 172-206 mm TL), 0885H, 0886H, PEM 14920 (RUSI 35520) (only one entire); North Atlantic (JLBS material), southeastern Cape; Id. RHG, MJS, MEA.

**Otolith shape**: Oval. **Thickness**: Moderately thin. **Form**: - Mesial flat, - Lateral convex. **Dorsal margin**: Rounded; **sculpture**, entire. **Ventral margin**: Slightly rounded and slightly lobed. **Posterior margin**: Rounded and entire. **Sulcus acusticus**: Ostial, archaesusulcoid. **Colliculum**: Single colliculum with anterior elongate pit. **Pseudocolliculum**: Absent. **Ostium and cauda**: Not differentiated, sulcus has a deep trough, colliculum fills posterior sulcus, tip indistinct. **Ostio-caudal differentiation**: Not constricted. **Collum**: Absent. **Crista superior**: Absent. **Crista inferior**: Absent. **Dorsal depression**: Absent. **Ventral depression**: Slit under colliculum. **Rostrum**: Minute, rounded. **Antirostrum**: Absent. **Excisura**: Very narrow, notch absent.

### ORDER AULOPIFORMES

### CHLOROPHTHALMIDAE Nelson No. 154

**Family characteristics**: Otolith oval or oblong, sulcus opening ostial. Cauda straight with distinct cristae, otoliths moderately large, grow to at least 4.4 mm.



## Key

- 1a. Otolith oval with its anterior and posterior tips produced and tapered; ostium well defined . . . . . *Bathysauropsis gracilis* 76.7
- 1b. Otolith oblong; anterior and posterior margins blunt, not produced; ostium poorly defined . . . . . *Chlorophthalmus punctatus* 76.9

### *Bathysauropsis gracilis*, SSF No. 76.7 PLATE 14

**DISTRIBUTION:** Off Cape Point and south of Madagascar; circumglobal in southern oceans. Attains 32 cm.

**MATERIAL:** 1/1 (4.45 mm OD, 225 mm TL), PEM 15355 (RUSI 38216); north-west of St Helena Bay; Id. MEA.

**Otolith shape:** Approximately oval. **Thickness:** Moderately thick. **Form:** - **Mesial** convex, - **Lateral** convex. **Dorsal margin:** Rounded and emarginate at extremes; **sculpture**, slightly irregular. **Ventral margin:** Rounded, emarginate at extremes and entire. **Posterior margin:** Tip narrows and sharply rounded, entire. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Homomorph, very low posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Flares dorsally, slightly rounded ventrally, dorsal area overhangs ostium. **Cauda:** Approximately straight and horizontal, walls steep. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.5. **Collum:** Absent, slight step up to cauda. **Crista superior:** Ridge-like along entire sulcus, absent at tip. **Crista inferior:** Ridge-like along entire sulcus, absent at tip. **Dorsal depression:** Large and oval, margin distinctly depressed with rim. **Ventral depression:** Large, most of ventral area, margin depressed. **Rostrum:** Large and tapering, sharply rounded. **Antirostrum:** Short and rounded. **Excisura:** Wide, notch very shallow, angle wide.

### *Chlorophthalmus punctatus*, SSF No. 76.9 PLATE 14

**NOTE:** The status of this genus is uncertain, it may represent a species complex. We found some variation in otoliths of this species collected from different areas. Until the taxonomy is resolved, we tentatively refer our material to *C. punctatus*.

**DISTRIBUTION:** Occurs along both coasts of South Africa. *C. punctatus* unreported elsewhere; but other species in the *C. agassizii* complex are circumglobal in warm seas. Attains 20 cm.

**MATERIAL:** 6/45 (3.9-7.62 mm OD, 110 mm SL - 231 mm TL), PEM 12792, 15027 (RUSI 35556), 12525 (RUSI 34134), 13041 (RUSI 28290), 5040, 5039, [14453 (RUSI 31392), 8 others have RUSI vouchers]; Mozambique, Kenya, Cape south coast and off Kunene River mouth; Id. MJS, PCH.

**Otolith shape:** Oblong. **Thickness:** Thin. **Form:** - **Mesial** slightly convex, - **Lateral** flat. **Dorsal margin:** Flattened; **sculpture**, irregular or lobed. **Ventral margin:** Rounded, irregular to lobed. **Posterior margin:** Rounded, slightly irregular or lobed. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** No raised colliculi. **Pseudocolliculum:** Absent. **Ostium:** Poorly defined, flared and slightly deeper than cauda, opens to antero-dorsal corner. **Cauda:** Straight, angled at c. 45 degrees, well defined by cristae, poorly defined at tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:2.1, 1:2.2, 1:2.1, 1:2.1, 1:2.1, 1:2.2. **Collum:** Absent, V-shaped step between ostium and cauda. **Crista superior:** Straight and ridge-like over the cauda only. **Crista inferior:** Ridge-like under the cauda with slight posterior ventral flexion, poor under ostium. **Dorsal depression:** Shallow and elongate above crista. **Ventral depression:** Absent. **Rostrum:** Short, broad and rounded, but may be notched. **Antirostrum:** Minute to absent. **Excisura:** Moderate, notch absent.

## SCOPELARCHIDAE Nelson No. 155

**Family characteristics:** Otoliths attain at least 6 mm. Shapes vary considerably, sulcus angled off the horizontal. Raised colliculi of unequal size.

## Key

- 1a. Otolith horned and rectangular; sulcus angled at 45° off horizontal, colliculi small and low . . . . . *Benthalbella macropinna* 77.2
- 1b. Otolith bullet shaped; sulcus angled at 10° off horizontal; colliculi raised . . . . . *Scopelarchus analis* 77.6

### *Benthalbella macropinna*, SSF No. 77.2 PLATE 14

**DISTRIBUTION:** Off southwest Cape coast; circumpolar in subantarctic and Antarctic waters. Attains 23 cm SL.

**MATERIAL:** 1/1 (5.9 mm OD, 267 mm TL), PEM 13412; off Cape west coast; lodged in SAM.

**Otolith shape:** Rectangular, ventral corners are extended, may be horn-like. **Thickness:** Thin. **Form:** - **Mesial** almost flat, - **Lateral** flat. **Dorsal margin:** Flat; **sculpture**, slightly irregular. **Ventral margin:** Generally flattened with extended ventral corners. **Posterior margin:** Approximately flat and undulating. **Sulcus acusticus:** Para-ostial, opening onto anterior wall, heterosulcoid. **Colliculum:** Heteromorph, anterior colliculum smaller and lower than posterior. **Pseudocolliculum:** Absent. **Ostium:** Oval, containing circular colliculum with canal to anterior wall, sulcus angled dorsally at 45°. **Cauda:** Elongate, and larger than ostium filled with large, irregularly-surfaced colliculum. **Ostio-caudal differentiation:** Slight ventral constriction. **Ostium/cauda:** 1:1.6. **Collum:** Wall-like, lower than posterior colliculum. **Crista superior:** Ridge-like over central 1/3rd of sulcus only. **Crista inferior:** Well developed along entire sulcus, except extreme anterior. **Dorsal depression:** Absent. **Ventral depression:** Absent. **Rostrum:** Prominent and pointed or finger-like. **Antirostrum:** Large, broad and rounded. **Excisura:** Minute, notch very wide, meets excisura and includes most of anterior margin.

### *Scopelarchus analis*, SSF No. 77.6 PLATE 14

**DISTRIBUTION:** Common off southern Africa; tropical/sub-tropical waters of all oceans. Attains 126 mm SL.

**MATERIAL:** 1/1 (3.45 mm OD, 56 mm SL), 0257H; IOEM; Id. AK.

**Otolith shape:** Oval to bullet-shaped with flattened anterior margin. **Thickness:** Moderately thin. **Form:** - **Mesial** flat, - **Lateral** convex. **Dorsal margin:** Flat; **sculpture**, slightly irregular. **Ventral margin:** Almost flat and slightly sinuate. **Posterior margin:** Rounded and slightly sinuate. **Sulcus acusticus:** Mesial, archae-sulcoid. **Colliculum:** Heteromorph, circular colliculi, anterior larger than posterior. **Pseudocolliculum:** Absent. **Ostium and cauda:** Undifferentiated in poorly defined sulcus, angled at c. 15 degrees. **Ostio-caudal differentiation:** No constrictions. **Collum:** Absent. **Crista superior:** Absent. **Crista inferior:** Ridge-like between colliculi only. **Dorsal depression:** Absent. **Ventral depression:** Slight depression below crista. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

## NOTOSUDIDAE Nelson No. 156

**Family characteristics:** Otoliths oblong with pointed tip, blunt posteriorly, up to c. 5mm, sulcus straight, cauda with ridge-like cristae along most of length.



## Key

- 1a. Cauda with key-hole depression; antirostrum small; excisura notched . . . . . *Scopelosaurus meadi* 78.6
- 1b. Cauda without key-hole depression; antirostrum minute or absent; excisura without notch . . . . . *Scopelosaurus ahlstromi* 78.3

### *Scopelosaurus ahlstromi*, SSF No. 78.3 PLATE 14

**DISTRIBUTION:** From c. 32° to c. 45° S, in all three oceans; small adolescents in Indian Ocean northward to c. 12° S. Attains 20 cm.  
**MATERIAL:** 4/6 (3.1-4.9 mm OD, 110-201 mm TL), PEM13249, 15360 (RUSI 38220), 13334, 15359 (RUSI 38220); Cape west coast; Id. MEA.

**Otolith shape:** Oblong, pointed anteriorly. **Thickness:** Thin. **Form:** - Mesial flat, - Lateral flat. **Lateral surface:** Irregular with flattened, nodular appearance with smooth perimeter. **Dorsal margin:** Flat or slightly rounded; **sculpture,** slightly irregular. **Ventral margin:** Flat or slightly rounded and slightly irregular. **Posterior margin:** Straight and slightly irregular. **Sulcus acusticus:** Ostial, pseudo-archaeosulcoid. **Colliculum:** No raised colliculi. **Pseudocolliculum:** Absent. **Ostium:** Slightly deeper than cauda, not flared. **Cauda:** Straight, horizontal, tip poorly defined. **Ostio-caudal differentiation:** No constrictions. **Ostium/cauda:** 1:1.3, 1:1.4, 1:1.6, 1:1.3. **Collum:** Absent but slight step up to cauda. **Crista superior:** Well developed over ostium, ridge-like over cauda, absent over posterior cauda and tip. **Crista inferior:** Ridge-like and broad along length of sulcus, except posterior cauda and tip. **Dorsal depression:** Very shallow and oblong. **Ventral depression:** Absent. **Rostrum:** Moderate and narrows to a point. **Antirostrum:** Absent. **Excisura:** Moderate, notch absent.

### *Scopelosaurus meadi*, SSF No. 78.6 PLATE 14

**DISTRIBUTION:** From c. 19° to c. 43° S; in all three oceans. Attains 20(?) cm.

**MATERIAL:** 2/2 (4.5, 4.9 mm OD, 204, 225 mm TL), PEM13333, 13332; Cape west coast; lodged in SAM.

**Otolith shape:** Oblong to ovate. **Thickness:** Thin. **Form:** - Mesial flat, - Lateral flat. **Lateral surface:** Slight low-nodular patterning, with smooth perimeter. **Dorsal margin:** Slightly rounded; **sculpture,** irregular. **Ventral margin:** Slightly rounded and irregular. **Posterior margin:** Rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** No raised colliculi. **Pseudocolliculum:** Absent. **Ostium:** Flares dorsally and is deeper than cauda. **Cauda:** Straight, horizontal with posterior keyhole-shaped depression. **Ostio-caudal differentiation:** Slight dorsal constriction. **Ostium/cauda:** 1:1.7, 1:1.5. **Collum:** Absent, with slight V-shaped step up to cauda. **Crista superior:** Well developed over ostium, ridge-like above cauda only, absent over posterior cauda and tip. **Crista inferior:** Poorly developed under ostium, ridge-like under cauda, absent under pit and at tip. **Dorsal depression:** Shallow and narrow. **Ventral depression:** Absent. **Rostrum:** Moderate, narrowing to a point. **Antirostrum:** Minute and rounded. **Excisura:** Moderate, notch shallow and acute, or absent.

## SYNODONTIDAE Nelson No. 157

**Family characteristics:** Otoliths moderate in size (to c. 12 mm). Shape varies, ostial, heterosulcoid and heteromorph with very low colliculi. Cauda variable, straight, sinuate and/or ventrally flexed.

## Key

- 1a. Cauda straight, narrow and horizontal . . . . . 2
- 1b. Cauda flexed or sinuate and relatively wide . . . . . 4
- 2a. Ostium short, flared dorsally widely; rostrum short and broad . . . . . *Bathysaurus ferox* 79.1
- 2b. Ostium elongate, not widely flared; rostrum elongate . . . 3

- 3a. Dorsal area depressed and becomes reduced and emarginate with growth; rostrum produced . . . . . *Saurida gracilis* 79.2
- 3b. Dorsal area not distinctly depressed and reduced, not strongly emarginate; rostrum not elongate . . . . . *Saurida undosquamis* 79.3
- 4a. Otolith elliptic; ventral margin rounded or well rounded; rostrum tapered; cauda slightly dorsally angled and sinuate; postcaudal trough present . . . . . *Trachinocephalus myops* 79.10
- 4b. Otoliths ovate, stubby to oblong; ventral margin flattened; rostrum not tapered; cauda distinctly flexed; post caudal trough absent . . . . . 5
- 5a. Rostrum short; ostium short and deep; cauda sinuous and elongate . . . . . *Synodus indicus* 79.7
- 5b. Rostrum moderate; ostium moderate, shallower; cauda shorter . . . . . *Synodus variegatus* 79.9

### *Bathysaurus ferox*, SSF No. 79.1 PLATE 15

**DISTRIBUTION:** Off the Cape, both sides of the Atlantic Ocean and off New Zealand. Attains 60 cm.

**MATERIAL:** 6/9 (4.35-11.1 mm OD, 287-615 mm TL), PEM 15350 (RUSI 38047), 12144, 13763, 13479, 13762, 13761; Cape west coast; Id. MJS, MEA.

**Otolith shape:** Oblong - may be oval in small otoliths, elongating with growth. **Thickness:** Moderately thin. **Form:** - Mesial convex, - Lateral approximately flat. **Lateral surface:** May be a pit or raised in nucleus region. **Dorsal margin:** Rounded becoming emarginate (c. 10 mm OD); **sculpture,** lobed to irregular with growth. **Ventral margin:** Rounded, sculpture entire to crenate. **Posterior margin:** Rounded to sharply rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, very low indented anterior and posterior colliculi. **Pseudocolliculum:** Absent. **Ostium:** Flared dorsally, low colliculum. **Cauda:** Horizontal and straight, narrow with V-shaped cross section and opens dorsally at tip. **Ostio-caudal differentiation:** Dorsally constricted. **Ostium/cauda:** 1:1.9, 1:2.3, 1:1.8, 1:2.3, 1:2.0, 1:2.2. **Collum:** Absent, no distinct step. **Crista superior:** Moderately well developed over ostium, well developed along cauda (may become ridge-like), absent above ostium. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Present, may be very deep. **Ventral depression:** Absent. **Rostrum:** Small, broad and rounded. **Antirostrum:** Minute, rounded. **Excisura:** Moderate, notch absent.

### *Saurida gracilis*, SSF No. 79.2 PLATE 15

**DISTRIBUTION:** A widely-distributed Indo-West Pacific species extending south to Algoa Bay. Attains 20 cm.

**MATERIAL:** 5/6 (3.4-11.9 mm OD, 111-359 mm TL), PEM 15447 (RUSI 40565), 8330, 4846, 5072, 5073; Kenya to East London and Madagascar (or Bazaruto); Id. MJS, PCH.

**Otolith shape:** Oblong. **Thickness:** Thin. **Form:** - Mesial convex, - Lateral flat. **Dorsal margin:** Flattened or emarginate, posterior develops a block-like lobe (>6 mm OD); **sculpture,** sinuate or irregular. **Ventral margin:** Gently rounded and crenate. **Posterior margin:** Flattened to rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, very low anterior and posterior colliculi. **Pseudocolliculum:** Absent. **Ostium:** Slightly flared dorsally, slightly deeper than cauda. **Cauda:** Straight and horizontal, gently flared dorsally, tip poorly defined. **Ostio-caudal differentiation:** Slight dorso-ventral constriction. **Ostium/cauda:** 1:0.9, 1:0.9, 1:1.1, 1:1.3, 1:1.3. **Collum:** Absent, slight step to cauda. **Crista superior:** Ridge-like along anterior 2/3rds of sulcus only, absent at posterior and tip. **Crista inferior:** Well developed along length of sulcus, absent at extreme



anterior and posterior. **Dorsal depression:** Small and elongate above crista, may be a dorsal ridge before area drops to margin. Posteriorly, dorsal area is raised to a smooth plateau. **Ventral depression:** Absent, steep drop to margin. **Rostrum:** Large, tapering and sharply rounded or pointed. **Antirostrum:** Absent or minute. **Excisura:** Moderate, notch shallow and wide.

#### *Saurida undosquamis*, SSF No. 79.3 PLATE 15

**DISTRIBUTION:** Common throughout Indo-West Pacific (immi-grant to Mediterranean); extends west to Knysna. Attains 50 cm. **MATERIAL:** 6/30 (5.7-11 mm OD, 159-341 mm TL), PEM 12456, 12455, 12927, 12827, 12919, 12826 (RUSI 28288), [15013 (RUSI 35583)]; Mozambique and southeastern coast; Id. MJS, PCH.

**Otolith shape:** Oblong. **Thickness:** Moderately thin. **Form:** - Mesial convex, - Lateral flat. **Dorsal margin:** Flattened; sculpture, irregular to lobed. **Ventral margin:** Gently rounded, anteriorly slightly irregular. **Posterior margin:** Rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, very low anterior and posterior colliculi. **Pseudocolliculum:** Absent. **Ostium:** Elongate, slight dorsal flare, ventral margin horizontal. **Cauda:** Straight and horizontal, slightly flared posteriorly, tip poorly defined. **Ostio-caudal differentiation:** Slight dorsal constriction. **Ostium/cauda:** 1:1.2, 1:1.1, 1:1.2, 1:1.0, 1:1.2, 1:1.2. **Collum:** Absent. **Crista superior:** Poorly developed over ostium, ridge-like along 2/3rds of cauda, absent at posterior and tip. **Crista inferior:** Well developed along length of sulcus except at extremities. **Dorsal depression:** Elongate, close to margin; posteriorly, dorsal area is raised to smooth plateau. **Ventral depression:** Absent. **Rostrum:** Moderate, tapering and sharply rounded or pointed. **Antirostrum:** Minute or absent. **Excisura:** Moderate, notch very shallow, angle wide.

#### *Synodus indicus*, SSF No. 79.7 PLATE 15

**DISTRIBUTION:** Throughout Indian Ocean; common in Natal, occasional specimens reach Mossel Bay. Attains 33 cm. **MATERIAL:** 6/12 (1.6-3.7 mm OD, 102-310 mm TL), PEM 4404 (RUSI 16062), 7818 (RUSI 28287), 5000, 7946, 8758, 1974, [0798H (RUSI 15969)]; Natal and eastern Cape; Id. MJS, PCH, MEA.

**Otolith shape:** Ovate to trapezoid. **Thickness:** Relatively thick. **Form:** - Mesial convex, - Lateral flat. **Dorsal margin:** Flat; sculpture, irregular. **Ventral margin:** Flattened and slightly irregular. **Posterior margin:** Flattened with indentation at midpoint and entire. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, very low anterior and posterior colliculi. **Pseudocolliculum:** Absent. **Ostium:** Very deep, short, may penetrate to lateral surface in large otoliths. **Cauda:** Sinuate with ventral flexion. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.3, 1:2.4, 1:1.5, 1:2.0, 1:1.6, 1:1.4. **Collum:** Absent, step up to cauda. **Crista superior:** Ridge-like over anterior half of sulcus, very poorly developed to tip. **Crista inferior:** Well developed along entire length of sulcus. **Dorsal depression:** Oval, above dorsal crista. **Ventral depression:** Absent, trough near margin may be present. **Rostrum:** Moderate and broad, rounded to sharply rounded. **Antirostrum:** Large or small, sharply rounded. **Excisura:** Moderate, notch shallow or deep, angle varies.

#### *Synodus variegatus*, SSF No. 79.9 PLATE 15

**DISTRIBUTION:** Common throughout Indo-West Pacific; extends south to Durban. Attains 22 cm. **MATERIAL:** 4/6 (1.2-2.2 mm OD, 68-186 mm TL), PEM 13445, 1036H, 1005H, 1032H; Eilat (JLSII otoliths), locality unknown 13445; Id. TH, MJS.

**Otolith shape:** Ovate. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral slightly convex. **Dorsal margin:** Flattened; sculpture, irregular. **Ventral margin:** Flattened and slightly irregular to entire in small otoliths. **Posterior margin:** Flat and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, very low anterior and posterior colliculi. **Pseudocolliculum:** Absent. **Ostium:** Deep, floor uneven. **Cauda:** Flares posteriorly, flexed ventrally. **Ostio-caudal differentiation:** Slight dorso-ventral constrictions. **Ostium/cauda:** 1:1.4, 1:1.1, 1:1.1, 1:1.1. **Collum:** Absent, step up to cauda. **Crista superior:** Ridge-like over anterior half of sulcus, poor over posterior cauda. **Crista inferior:** Well developed along entire sulcus, along cauda may be ridge-like. **Dorsal depression:** Deep to very deep above crista. **Ventral depression:** Absent, ventral trough near margin in some otoliths. **Rostrum:** Large, tapering and sharply rounded. **Antirostrum:** Small and rounded to irregular. **Excisura:** Moderate, notch shallow and angle wide.

#### *Trachinocephalus myops*, SSF No. 79.10 PLATE 16

**DISTRIBUTION:** Pantropical; along the east coast to Knysna, and in the Atlantic south to Luderitz, Namibia. Attains 38 cm.

**MATERIAL:** 4/5 (6.8-9.6 mm OD, 170-210 mm TL), PEM 2582, 0612, 1386H, 5967, [15567 (RUSI 42661)]; Durban and Knysna; Id. MJS, PCH.

**Otolith shape:** Elliptic. **Otolith thickness:** Medium thick. **Form:** - Mesial convex, - Lateral convex. **Dorsal margin:** Flattened; sculpture, irregular or dentate. **Ventral margin:** Well rounded and sinuate to dentate, or entire. **Posterior margin:** Rounded and irregular to dentate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, extremely low anterior and posterior colliculi. **Pseudocolliculum:** Absent. **Ostium:** Slightly flared ventrally, deep. **Cauda:** Closer to dorsal margin, sinuate and flexed ventrally, flared posteriorly. Post-caudal trough to posterior margin. **Ostio-caudal differentiation:** Sharply dorso-ventrally constricted to narrow neck. **Ostium/cauda:** 1:1.3, 1:1.6, 1:1.2, 1:1.4. **Collum:** Absent, step up to cauda. **Crista superior:** Ridge-like over ostium and anterior cauda, reduced to very poorly developed posteriorly. **Crista inferior:** Well developed under ostium and cauda. **Dorsal depression:** Narrow and elongate above ostio-caudal junction. **Ventral depression:** Absent. **Rostrum:** Small and pointed. **Antirostrum:** Small and rounded or irregular. **Excisura:** Small, notch shallow, angle acute.

#### PARALEPIDIDAE Nelson No. 159

**Family characteristics:** Sulcus poorly defined, heterosulcoid, heteromorph with raised colliculi and rostrum large. Rectangular or triangular otoliths and moderately small (<c. 6 mm OD).

##### Key

- 1a. Otolith triangular and ventrally horned; colliculi distinct; dorsal margin lobed . . . . . *Paralepis atlantica* 81.-
- 1b. Otolith rectangular; colliculi raised; dorsal margin approximately flat, not raised. Three genera are difficult to separate but minor differences in colliculi and otolith shapes may aid identification:  
*Lestidiops similis* 81.2, *Lestrolepis intermedia* 81.4,  
*Macroparalepis macrogeneion* 81.6

#### *Lestidiops similis*, SSF No. 81.2 PLATE 16

**DISTRIBUTION:** Known from temperate and tropical Atlantic from between 45°N and 45°S. Attains c. 20 cm.

**MATERIAL:** 4/7 (3.3-3.7 mm OD, 219-224 mm TL), PEM 14144 (RUSI 28291), 14148, 14149 (RUSI 28293), 14145, [14146 (RUSI 28292), 14150 (RUSI 28294)]; Cape west coast; Id. MEA (X-ray vertebral counts).

**Otolith shape:** Rectangular. **Thickness:** Thin. **Form:** - Mesial flat, - Lateral flat. **Dorsal margin:** Flat with notch; sculpture,



sinuate. **Ventral margin:** Slightly emarginate and slightly lobed. **Posterior margin:** Straight and irregularly lobed. **Sulcus acusticus:** Ostio-caudal but sulcus margins indistinct, heterosulcoid. **Colliculum:** Heteromorph. **Pseudocolliculum:** Small and lies below the two colliculi. **Ostium:** Anterior colliculum in ostium is large and elongate. **Cauda:** Has smaller, oval colliculum. **Ostio-caudal differentiation:** No constrictions. **Ostium/cauda:** 1:1, 1:1, 1:1, 1:0.9. **Collum:** Absent. **Crista superior:** Absent. **Crista inferior:** Absent. **Dorsal depression:** Absent, but dorsal area lower than ventral area. **Ventral depression:** Absent but area below it raised, crescentic and smooth. **Rostrum:** Very large and broad, comprising anterior third of otolith; blunt and irregularly lobed. **Antirostrum:** High and almost vertical with rounded tip. **Excisura:** Wide, notch shallow, angle wide.

#### *Lestrolepis intermedia*, SSF No. 81.4 PLATE 16

**DISTRIBUTION:** Strictly tropical in all oceans; off South Africa only in Agulhas Current. Attains c. 25 cm.

**MATERIAL:** 2/2 (4.3, 4.8 mm OD, 252, 254 mm TL), PEM 5034, 5035; Kenya; Id. PCH.

**Otolith shape:** Rectangular. **Thickness:** Thin. **Form:** - Mesial flat, - Lateral flat. **Dorsal margin:** Flat with notch; sculpture, sinuate or irregular. **Ventral margin:** Approximately flat and slightly irregular. **Posterior margin:** Straight or bifid and lobed. **Sulcus acusticus:** Ostio-caudal with poorly defined sulcus, heterosulcoid. **Colliculum:** Heteromorph. **Pseudocolliculum:** Present - elongate, below and between colliculi. **Ostium:** A large, elongate and raised colliculum present, penetrates through dorsal wall; margins of ostium not defined. **Cauda:** Contains smaller, irregularly shaped raised colliculum; margins of cauda not defined. **Ostio-caudal differentiation:** Not constricted. **Ostium/cauda:** 1:0.7, 1:0.9. **Collum:** Absent. **Crista superior:** Absent. **Crista inferior:** Absent. **Dorsal depression:** Absent, but dorsal area lower than ventral. **Ventral depression:** No depression, but ventral area is raised and smooth with semi-circular ventral groove. **Rostrum:** Very large, blunt and lobed. **Antirostrum:** Small, almost vertical wall. **Excisura:** Wide, notch shallow, angle wide.

#### *Macroparalepis macrogeneion*, SSF No. 81.6 PLATE 16

**DISTRIBUTION:** South Atlantic subtropical convergence area from South Africa to South America. Attains 42 cm.

**MATERIAL:** 1/1 (3.3 mm OD, 275 mm TL), PEM 12315; Cape west coast; Id. PC, no voucher - identification tentative.

**Otolith shape:** Rectangular. **Thickness:** Thin. **Form:** - Mesial flat, - Lateral flat. **Dorsal margin:** Flat with notch sculpture, Slightly irregular. **Ventral margin:** Undulating and entire. **Posterior margin:** Bifid and entire. **Sulcus acusticus:** Ostio-caudal, heterosulcoid. **Colliculum:** Heteromorph. **Pseudocolliculum:** Present but very poorly defined. **Ostium:** Contains large, elongate colliculum, margins of ostium not defined. **Cauda:** Contains small, circular and raised colliculum, margins of cauda not defined. **Ostio-caudal differentiation:** No constrictions. **Ostium/cauda:** 1:0.9. **Collum:** Absent. **Crista superior:** Absent. **Crista inferior:** Absent. **Dorsal depression:** Absent but dorsal area lower than ventral. **Ventral depression:** Absent, a semicircular raised, smooth area beneath colliculi, with ventral groove. **Rostrum:** Large, blunt and lobed. **Antirostrum:** Small, forms vertical wall. **Excisura:** Wide, notch shallow, angle wide.

#### *Paralepis atlantica*, Krøyer, 1868 SSF No. 81.- PLATE 16

**DISTRIBUTION:** Not known to occur in this area, found off California.

**MATERIAL:** 1/1 (5.84 mm OD, TL not recorded), PEM 0966; California; Id. JEF.

**Otolith shape:** Triangular. **Thickness:** Thin. **Form:** - Mesial flat, - Lateral flat. **Dorsal margin:** Domed; sculpture, lobed. **Ventral margin:** Emarginate, slightly irregular. **Posterior margin:** Lobed and entire. **Sulcus acusticus:** Ostio-caudal, heterosulcoid. **Colliculum:** Heteromorph. **Pseudocolliculum:** Absent. **Ostium:** Contains very large, protruding colliculum. **Cauda:** Contains small, less raised and irregularly shaped colliculum, protruding through posterior wall. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.0. **Collum:** A low raised area between colliculi. **Crista superior:** Absent. **Crista inferior:** Poorly developed. **Dorsal depression:** Absent, area flat. **Ventral depression:** Absent. **Rostrum:** Very large and narrows to a point, flexed ventrally. **Antirostrum:** Domed and high. **Excisura:** Moderate, notch shallow and angle wide.

#### ALEPOSAURIDAE Nelson No. 163

**Family characteristics:** Only one species available: otolith small (c. 1.3 mm OD), circular, archaesusulcoid, homomorph.

#### *Alepisaurus ferox*, SSF No. 85.2 PLATE 16

**DISTRIBUTION:** Walvis Bay to Sodwana Bay; in all major oceans. Attains 200 cm.

**MATERIAL:** 2/2 (0.75, 1.3 mm OD, 710 mm SL, size of 0931 not recorded), PEM 15635, 0931; Grand Comoro, 0931 locality unknown; Id. PCH, JEF.

**Otolith shape:** Approximately circular. **Thickness:** Moderately thin. **Form:** - Mesial slightly concave, - Lateral convex. **Dorsal margin:** Rounded; sculpture, slightly irregular. **Ventral margin:** Slightly flattened and irregular. **Posterior margin:** Rounded and slightly sinuate. **Sulcus acusticus:** Ostial-caudal, archaesusulcoid. **Colliculum:** Homomorph, a single colliculum fills the sulcus. **Pseudocolliculum:** Absent. **Ostium and cauda:** Undifferentiated, sulcus is completely filled with the irregular colliculum which has a large, deep anterior pit. **Ostio-caudal differentiation:** No constrictions. **Collum:** Absent. **Crista superior:** Absent. **Crista inferior:** Absent. **Dorsal depression:** Dorsal area slopes in towards sulcus, may meet it as a groove. **Ventral depression:** Absent but there is a deep groove below the sulcus which opens to the posterior margin. **Rostrum:** Short, broad and rounded. **Antirostrum:** Absent or minute and rounded. **Excisura:** Moderate, notch minute or absent.

#### ORDER MYCTOPHIFORMES

#### MYCTOPHIDAE Nelson No. 166

**Family characteristics:** This is a speciose family and the key should be used with caution as differences between species are subtle and ontogenetic changes in otolith shape with growth are common. The otoliths are generally small (<c. 9 mm OD) and moderately thin and their shapes vary fairly widely, including tall, discoid or oval-ovate. The sulcus acusticus is usually very shallow and horizontal. Anterior colliculum often elongate, posterior round or oval. The pseudocolliculum is generally characteristic of the family and lies below the posterior colliculum. Rostrum and antirostrum small, may be similar in size.

#### Key

##### 1. OTOLITH SHAPE:

- a. Tall and rectangular . . . . . 2
- b. Tall ear-shaped, broader ventrally than dorsally . . . . . 3
- c. Kidney-shaped, taller than elongate - dorsal and ventral margins of otolith slightly bulbous anteriorly, excisural notch present, angle wide . . . . . 5
- d. Discoid, otolith approximately circular with shallow excisural notch . . . . . 9



- e. Oblong, oval or oblong-ovate to elongate . . . . . 18
- f. Oval-obovate . . . . . 30
- g. Triangular-ovate or pentagonal-ovate . . . . . 34
- h. Ovate with very distinct postero-dorsal notch . . . . . 36
- i. Ovate with very distinct and broad rostrum but small or minute antirostrum and very shallow excisural notch, angle usually obtuse . . . . . 40
- j. Rounded-ovate . . . . . 45
- TALL AND RECTANGULAR**
2. Otoliths approximately rectangular, tall; anterior and posterior margins approximately parallel; rostrum absent; antirostrum absent; colliculi barely visible . . . . . *Lampanyctus achirus* 86.73 and *L. ater* 86.75
- TALL EAR-SHAPED**
- 3a. Colliculi distinctly depressed; pseudocolliculum becomes distinct and elongate . . . . . *Kreftlichthys anderssoni* 86.64
- 3b. Colliculi raised; pseudocolliculum low or absent . . . . . 4
- 4a. Antirostrum absent or short, broad and rounded; posterior colliculum circular and raised; ventral area without depression but margin may be slightly depressed . . . . . *Gymnoscopelus opisthopterus* 86.54
- 4b. Antirostrum usually absent; posterior colliculum oval and relatively large; ventral area with wide depression near margin . . . . . *Lampanyctus macdonaldi* 86.81
- KIDNEY-SHAPED**
- 5a. Pseudocolliculum distinct and elongate . . . . . 6
- 5b. Pseudocolliculum small or low and indistinct . . . . . 8
- 6a. Excisural notch acute, deep and distinct; ventral margin of otolith bulbous or with narrow lobe . . . . . *Protomyctophum normani* 86.116
- 6b. Excisural notch wide and shallow; ventral margin of otolith rounded, not lobed or bulbous . . . . . 7
- 7a. Ventral margin rounded, not emarginate; antirostrum and rostrum very short, broad and rounded; dorsal margin of otolith rounded and entire . . . . . *Protomyctophum bolini* 86.112
- 7b. Ventral margin rounded, may be emarginate posteriorly; antirostrum and rostrum more produced but broad and rounded; dorsal margin slightly rounded (may be slightly emarginate) and slightly irregular . . . . . *Protomyctophum tenisoni* 86.117
- 8a. Dorsal margin irregular; ventral margin rounded, but appears narrow; pseudocolliculum slightly raised and short . . . . . *Electrona antarctica* 86.44
- 8b. Dorsal margin rounded and entire; ventral margin rounded and broad; pseudocolliculum poorly defined . . . . . *Lampanyctus lepidolychnus* 86.79
- DISCOID**
- 9a. Dorsal margin of otolith somewhat flattened . . . . . 10
- 9b. Dorsal margin rounded . . . . . 12
- 10a. Dorsal area wide with antero-dorsal corner high making otolith appear top heavy . . . . . *Lampanyctus festivus* 86.77
- 10b. Dorsal area relatively narrower, antero-dorsal corner rounded, otolith without top heavy appearance . . . . . 11
- 11a. Antero-dorsal margin of otolith angled down to antirostrum; antirostrum less broad than *L. tenuiformis*; dorsal area not distinctly broad; pseudocolliculum distinct, separate from colliculum . . . . . *Lampanyctus intricarius* 86.78
- 11b. Antero-dorsal margin curves to rounded antirostrum; antirostrum broader; dorsal area broader than previous sp.; pseudocolliculum indistinct, apparently fused to anterior colliculum . . . . . *Lampanyctus tenuiformis* 86.86
- 12a. Otolith almost circular with margins rounded and entire; rostrum and antirostrum very short and broad . . . . . *Lampanyctus pusillus* 86.84
- 12b. Otolith discoid with distinct excisural notch and margins slightly irregular or crenate; rostrum and antirostrum distinct . . . . . 13
- 13a. Dorso-posterior corner of otolith slightly emarginate . . . . . *Hygophum proximum* 86.62
- 13b. Dorso-posterior margin of otolith without emargination but may be angled . . . . . 14
- 14a. Antirostrum distinct, angled and pointed; dorsal margin rounded but may be raised . . . . . *Hygophum hygomi* 86.61
- 14b. Antirostrum, if distinct, not angled and pointed; dorsal margin usually rounded but not raised . . . . . 15
- 15a. Antirostrum considerably narrower than rostrum; posterior colliculum short and rectangular . . . . . *Myctophum phengodes* 86.103
- 15b. Antirostrum almost as wide as rostrum; posterior colliculum not distinctly broad and rectangular . . . . . 16
- 16a. Dorsal margin of otolith slightly irregular; ventral margin bulbous, may be slightly lobed . . . . . *Electrona carlsbergi* 86.45
- 16b. Dorsal margin crenate to cockscombed; ventral margin rounded . . . . . 17
- 17a. Rostrum relatively short and broad; antirostrum similar sized to rostrum; dorsal margin crenate only, may be flattened . . . . . *Electrona risso* 86.47
- 17b. Rostrum large and broad; antirostrum smaller than rostrum; dorsal margin crenate to lobed, may be cockscomb-like . . . . . *Metelectrona ventralis* 86.97
- OBLONG, OVAL OR OBLONG-OVATE TO ELONGATE**
- 18a. Postero-dorsal margin of otolith slopes obliquely from anterior third of otolith; dorsal margin rounded and raised anteriorly; posterior margin narrow but blunt . . . . . *Diaphus problematicus* 86.34
- 18b. Postero-dorsal margin not sloping obliquely from anterior third of otolith; dorsal margin not rounded and raised anteriorly; posterior margin not narrow and blunt . . . . . 19
- 19a. Rostrum large and extended well beyond antirostrum . . . . . 20
- 19b. Rostrum short, similar length to antirostrum . . . . . 23
- 20a. Ventral margin of otolith entire; rostrum broad and rounded or angled . . . . . 21
- 20b. Ventral margin of otolith serrate or irregular; rostrum relatively elongate, may be broad . . . . . 22
- 21a. Rostrum relatively broad and angled; antirostrum small and sharply rounded; postero-dorsal corner right-angled but rounded . . . . . *Gymnoscopelus fraseri* 86.55
- 21b. Rostrum broad and rounded; antirostrum short, broad and rounded; postero-dorsal corner rounded or slightly emarginate, not right-angled . . . . . *Taaningichthys bathyphilus* 86.123
- 22a. Rostrum moderate and tapered; dorsal margin flattened to slightly emarginate; postero-dorsal corner lobed or angled (but not right-angled); pseudocolliculum absent . . . . . *Gymnoscopelus bolini* 86.5

- 22b. Rostrum elongate; dorsal margin slightly rounded or flattened; postero-dorsal corner rounded, not lobed or angled; pseudocolliculum distinct and ridge-like  
..... *Gymnoscopelus nicholsi* 86.53
- 23a. Rostrum and antirostrum approximately equal to each other in length ..... 24
- 23b. Rostrum broad, antirostrum distinctly shorter and broader than rostrum ..... 25
- 24a. Rostrum and antirostrum distinct, almost equal in length and breadth; sulcus indistinct; excisural notch acute; posterior margin of otolith blunt, may be slightly notched and lobed ..... *Lampanyctus vadulus* 86.-
- 24b. Rostrum short and very broad, antirostrum very short and papilla-like; sulcus distinct; excisural notch shallow and appears blunt; posterior margin of otolith rounded ..... *Scopelopsis multipunctatus* 86.118
- 25a. Ostium wide with its dorsal and ventral margins parallel; distance between rostrum and antirostrum tips wide but excisural notch extremely shallow; excisura with blunt appearance ..... 26
- 25b. Ostium relatively narrow, its dorsal and ventral margins not parallel; distance between rostrum and antirostrum tips relatively narrow but notch distinct; excisura more angled, does not appear blunt ..... 28
- 26a. Posterior margin of otolith tapered dorsally and ventrally, appears narrow; antirostrum minute ..... *Notoscopelus caudispinosus* 86.107
- 26b. Posterior margin of otolith not distinctly tapered, appears blunt; antirostrum small or short ..... 27
- 27a. Otolith relatively short; ventral margin entire or slightly irregular; posterior colliculum oval ..... *Lampichthy procerus* 86.90
- 27b. Otolith more elongate; ventral margin serrate; posterior colliculum rectangular with oblique anterior margin ..... *Notoscopelus resplendens* 86.108
- 28a. Ventral margin of otolith serrate; colliculi overlap at neck ..... *Gymnoscopelus piabilis* 86.58
- 28b. Ventral margin of otolith crenate or entire; colliculi do not overlap at neck ..... 29
- 29a. Posterior colliculum blunt and rectangular ..... *Myctophum aulolaternatum* 86.99
- 29b. Posterior colliculum not blunt and rectangular: two similar species may be distinguishable with material .... *Symbolophorus barnardi* 86.119, *Symbolophorus boops* 86.120
- OVAL-OBOVATE**
- 30a. Antero-dorsal corner angled sharply to antirostrum; postero-dorsal corner notched or oblique slope to posterior margin; rostrum short, broad and pointed ..... *Myctophum nitidulum* 86.101
- 30b. Antero-dorsal corner rounded, not angled sharply to antirostrum; not emarginate or oblique to posterior margin; rostrum broad and rounded or sharply rounded ..... 31
- 31a. Ostium oval, tapering to excisura; anterior colliculum oval but indistinct; posterior colliculum rectangular and blunt posteriorly but indistinct; pseudocolliculum poorly defined ..... *Gonichthys barnesi* 86.49
- 31b. Ostium elongate; anterior colliculum oblong; posterior colliculum oval, not distinctly blunt; pseudocolliculum distinct ..... 32
- 32a. Otolith distinctly obovate with top heavy appearance; sulcus below midline ..... *Lampanyctus photonotus* 86.83
- 32b. Otolith not distinctly top heavy; sulcus approximately in midline ..... 33
- 33a. Antirostrum broad and rounded; crista superior distinctly sinuous; posterior colliculum moderately elongate ..... *Lampanyctus alatus* 86.74
- 33b. Antirostrum angular and relatively narrow; crista superior not distinctly sinuous; posterior colliculum relatively shorter ..... *Lampanyctus australis* 86.76
- TRIANGULAR-OVATE AND PENTAGONAL-OVATE**
- 34a. Otolith triangular-ovate; posterior margin flat, notched or slightly emarginate ..... *Lampadena speculigera* 86.71
- 34b. Otolith pentagonal-ovate; posterior margin rounded, or angled ..... 35
- 35a. Upper posterior margin flat to slightly rounded; pseudocolliculum very poorly developed ..... *Myctophum obtusirostre* 86.102
- 35b. Upper posterior margin slightly emarginate; pseudocolliculum low but distinct ..... *Myctophum spinosum* 86.105
- OVATE WITH VERY DISTINCT POSTERO-DORSAL NOTCH**
- 36a. Postero-dorsal margin notch deep and very distinct ..... 37
- 36b. Postero-dorsal notch shallow and wide, may be emarginate ..... 38
- 37a. Postero-dorsal notch extremely deep and acutely angled, reaches cauda; dorsal margin flat or slightly angled; antirostrum absent or minute; excisura very wide; excisural notch very shallow, angle wide ..... *Lampadena luminosa* 86.68
- 37b. Postero-dorsal notch forms rounded right-angle; dorsal margin flat or slightly emarginate; antirostrum short, broad and sharply rounded; excisura wide; excisural notch shallow, angle acute ..... *Lampadena chavesi* 86.66
- 38a. Posterior margin angled or slightly rounded; postero-dorsal corner notch above caudal tip with obtuse angle; dorsal margin usually curves down to antirostrum ..... *Diaphus watasei* 86.41
- 38b. Posterior margin rounded or blunt; postero-dorsal corner notched or emarginate; dorsal margin angled to antirostrum ..... 39
- 39a. Anterior colliculum moderately broad; postero-dorsal notch distinct and angled; dorsal area broader (cf. *D. ostenfeldi*); ventral margin with short, wide serrations ..... *D. effulgens* 86.16
- 39b. Anterior colliculum elongate and moderately narrow; postero-dorsal notch present as shallow, broad and curved emargination; dorsal area slightly narrower (cf. *D. effulgens*); ventral margin with elongate, sharper serrations ..... *D. ostenfeldi* 86.30
- OVATE, EXCISURAL NOTCH SHALLOW WITH OBTUSE ANGLE**
- 40a. Sulcus distinct and wide; cristae distinct; caudal tip blunt ..... *Diaphus jenseni* 86.21
- 40b. Sulcus indistinct and narrow; cristae indistinct; caudal tip poorly defined, not blunt ..... 41
- 41a. Ventral margin of otolith crenate, serrate, lobed or irregular (may only be anterior part) ..... 42
- 41b. Ventral margin entire or slightly irregular ..... 43



- 42a. Rostrum tapered to point or sharply rounded; excisural notch extremely shallow; antirostrum absent or minute and rounded; pseudocolliculum ridge-like . . . . . *Ceratoscopelus warmingii* 86.9
- 42b. Rostrum broad angled and tip blunt; excisural notch shallow but distinct; antirostrum very small and rounded; pseudocolliculum present but very indistinct . . . . . *Bolinichthys supralateralis* 86.7
- 43a. Otolith relatively short and tall; rostrum large, broad and sharply rounded; antirostrum broad; pseudocolliculum absent or extremely poorly defined . . . . . *Gymnoscopelus braueri* 86.52
- 43b. Otolith not short and tall; rostrum shorter but broad; antirostrum very small or very short; pseudocolliculum distinct or low . . . . . 44
- 44a. Posterior margin emarginate dorsally; pseudocolliculum elongate and ridge-like . . . . . *Benthosema suborbitale* 86.3
- 44b. Posterior margin slightly flattened dorsally; pseudocolliculum low and indistinct . . . . . *Bolinichthys indicus* 86.4

#### ROUNDED-OVATE

- 45a. Dorsal margin of otolith raised, very crenate, lobed or cockscomb-like . . . . . *Metelectrona ventralis* 86.97
- 45b. Dorsal margin rounded, slightly rounded or flattened, rarely with small crenations but not cockscomb-like . . . . . 46
- 46a. Dorsal margin with peak, flattened or slightly emarginate posterior to peak . . . . . 47
- 46b. Dorsal margin without peak, usually rounded . . . . . 48
- 47a. Otolith relatively elongate, dorsal margin sinuous before low peak; posterior margin oblique and notched to serrate . . . . . *Lampadena notialis* 86.69
- 47b. Otolith shorter, dorsal margin not sinuate; posterior margin without notches and serrations: Four species which are difficult to separate without reference material as the otolith shape, size of rostrum, antirostrum and sulcus development similar: *Diaphus hudsoni* 86.20, *D. meadi* 86.26, *Lobianchia dofleini* 86.92, *L. gemellarii* 86.93
- 48a. Otolith slightly elongate; sulcus placed below midline of otolith; anterior colliculum wide and rectangular . . . . . *Diaphus garmani* 86.19
- 48b. Otoliths rounded; sulcus in midline of otolith, anterior colliculum not distinctly wide . . . . . 49
- 49a. Ventral margin of otolith with distinct, widely spaced serrations; rostrum usually blunt with papilla-like ventral serration at tip, but rarely pointed with papilla at tip . . . . . *Lampanyctodes hectoris* 86.72
- 49b. Ventral margin with serrations tightly-spaced, or absent; rostrum pointed or sharply rounded, without papilla-like ventral serration at tip . . . . . 50
- 50a. Ventral margin of otolith serrate anteriorly, with small tooth on postero-ventral corner . . . . . *Benthosema fibulatum* 86.1
- 50b. Ventral margin rounded, if serrate, no tooth on postero-ventral corner . . . . . 51
- 51a. Dorsal margin relatively flat in at least middle of otolith . . . . . 52
- 51b. Dorsal margin rounded . . . . . 54
- 52a. Dorsal margin raised giving otolith broad appearance; ventral margin with numerous large serrations; posterior margin of anterior colliculum rounded . . . . . *Diaphus metopoclampus* 86.27

- 52b. Dorsal margin of otolith not raised giving otolith more elongate appearance; ventral margin with smaller, less distinct serrations; posterior margin of anterior colliculum not distinctly rounded . . . . . 53
- 53a. Antero-dorsal margin angles to antirostrum; anterior colliculum elongate oval; sulcus extends along most of otolith, nearly reaching posterior margin . . . . . *Diaphus lucidus* 86.23
- 53b. Antero-dorsal margin curves to antirostrum; anterior colliculum shorter and broader; sulcus ends well short of posterior margin . . . . . *Diaphus mollis* 86.28
- 54a. Ventral margin serrate; crista superior slightly sinuous; dorsal area not wide; postero-dorsal margin narrows posteriorly . . . . . *Diaphus perspicillatus* 86.32
- 54b. Ventral margin crenate or slightly irregular; crista superior approximately horizontal, caudal tip may be flexed dorsally; dorsal area wide; postero-dorsal margin rounded, not narrowing . . . . . 55
- 55a. Ventral margin slightly irregular; pseudocolliculum ridge-like and striated; dorsal margin becomes lobed; posterior colliculum narrow and relatively elongate . . . . . *Hygophum hanseni* 86.60
- 55b. Ventral margin crenate and slightly irregular; pseudocolliculum may be indistinct or ridge-like, not striated; dorsal margin crenate or slightly irregular; posterior colliculum not elongate and narrow . . . . . 56
- 56a. Dorsal depression relatively deep; dorsal part of posterior margin slightly emarginate; dorsal margin becomes crenate; posterior colliculum approximately square . . . . . *Symbolophorus evermanni* 86.121
- 56b. Dorsal depression not as distinct and deep; dorsal part of posterior margin not emarginate, but may be slightly notched; dorsal margin slightly irregular; posterior colliculum tear-drop shaped or narrow and oval (not elongate) . . . . . 57
- 57a. Dorsal part of posterior margin slightly notched, may have broad posterior lobe; posterior colliculum tear-drop shaped; crenations under rostrum narrow . . . . . *Symbolophorus rufinus* 86.122
- 57b. Dorsal part of posterior margin without notch and broad posterior lobe; posterior colliculum narrow and oval; crenations under rostrum broad, may appear dentate . . . . . *Diaphus brachycephalus* 86.13

#### *Benthosema fibulatum*, SSF No. 86.1 PLATE 16

**DISTRIBUTION:** Indian Ocean (18°N - 20°S) - 40°S in Agulhas current, central Pacific (21°N - 10°S) and north of New Guinea. Attains 90 mm.

**MATERIAL:** 6/7 (3.3-3.7 mm OD, 76-85 mm TL), PEM 12958 (SAM 31649), 12960 (SAM 31648), 12961 (SAM 31650), 12945 (SAM 31652), 12946 (SAM 31651), 12959; off Mozambique; Id. PAH.

**Otolith shape:** Rounded-ovate to oval-ovate. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral flat. **Dorsal margin:** Rounded; **sculpture**, crenate or slightly irregular. **Ventral margin:** Rounded and serrate or slightly irregular. **Posterior margin:** Rounded and crenate or irregular with postero-ventral tooth. **Sulcus acusticus:** Ostial, approximately heterosulcoid. **Colliculum:** Heteromorph, anterior larger though similar shape. **Pseudocolliculum:** Present, ridge-like and longer than posterior colliculum. **Ostium:** Elongate, with oval colliculum, dorsal crista slightly curved. **Cauda:** Moderately short, oval colliculum, poorly defined posteriorly. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:0.8, 1:0.7, 1:0.6, 1:0.7, 1:0.9, 1:0.8.



**Collum:** Absent. **Crista superior:** Low ridge from ostium to mid-cauda but absent at caudal tip. **Crista inferior:** Poorly developed along entire sulcus. **Dorsal depression:** Oval and shallow over crista. **Ventral depression:** Groove-like depression near margin to edge. **Rostrum:** Short, broad and pointed or sharply rounded. **Antirostrum:** Small or moderate and pointed. **Excisura:** Moderate, notch shallow, angle acute.

***Benthosema suborbitale*, SSF No. 86.3 PLATE 16**

**DISTRIBUTION:** Broadly tropical distribution in Atlantic, Pacific and Indian oceans with extensions to 50°N and 50°S in western boundary currents. Attains 39 mm.

**MATERIAL:** 1/1 (1.6 mm OD, fish not measured), 0870H; East Australia; Id. RM.

**Otolith shape:** Approximately ovate. **Thickness:** Moderate. **Form:** - Mesial flat, - Lateral slightly convex. **Dorsal margin:** Rounded; **sculpture**, entire. **Ventral margin:** Rounded, slightly irregular or entire. **Posterior margin:** Rounded and emarginate dorsally and entire. **Sulcus acusticus:** Ostial, pseudo-archaeosulcoid, ostium and cauda distinguishable by colliculi and pseudocolliculum. **Colliculum:** Heteromorph, anterior and posterior colliculi barely raised and indistinct. **Pseudocolliculum:** Ridge-like, elongate and distinct. **Ostium:** Wide opening, poorly defined, sulcus angled antero-dorsally. **Cauda:** Poorly defined, pseudocolliculum clearly visible. **Ostio-caudal differentiation:** Slightly ventrally constricted. **Ostium/cauda:** 1:1.3. **Collum:** Absent. **Crista superior:** Absent. **Crista inferior:** Very poorly developed along entire sulcus. **Dorsal depression:** Absent. **Ventral depression:** Very shallow groove in mid-area. **Rostrum:** Short, broad and rounded to sharply rounded. **Antirostrum:** Very short and rounded. **Excisura:** Moderate, notch very shallow, angle wide.

***Bolinichthys indicus*, SSF No. 86.4 PLATE 17**

**DISTRIBUTION:** Indian Ocean (20° - 45°S) and Atlantic (20° - 50°N and 20° - 40°S). Attains 45 mm.

**MATERIAL:** 1/1 (1.4 mm OD, fish not measured), PEM 7998; north Atlantic; Id. PAH.

**Otolith shape:** Approximately ovate. **Thickness:** Moderately thick. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Rounded; **sculpture**, entire. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Sharply rounded, slightly flattened postero-dorsally and entire. **Sulcus acusticus:** Ostial, heterosulcoid, ostium flared but sulcus very poorly defined. **Colliculum:** Homomorph, posterior colliculum rounded, anterior colliculum not visible. **Pseudocolliculum:** Extremely low and indistinct. **Ostium:** Poorly defined, flared ventrally at anterior end. **Cauda:** Poorly defined, straight with rounded tip, and angled dorsally. **Ostio-caudal differentiation:** Absent. **Ostium/cauda:** 1:0.6. **Collum:** Absent. **Crista superior:** Short, very low ridge over posterior ostium, absent elsewhere. **Crista inferior:** Well developed in posterior ostium, poor to absent elsewhere. **Dorsal depression:** Oval and shallow. **Ventral depression:** Absent. **Rostrum:** Large, broad and sharply rounded. **Antirostrum:** Very small and rounded. **Excisura:** Moderate, notch very shallow, angle wide.

***Bolinichthys supralateralis*, SSF No. 86.7 PLATE 17**

**DISTRIBUTION:** Atlantic (40°N-02°S and 32°-40°S), Indian Oceans (21°-30°S), west coast of Australia, near Hawaii, off Cape Peninsula and in Agulhas current. Attains 117 mm.

**MATERIAL:** 3/16 (2.8-5.1 mm OD, 68-135 mm TL), PEM 13203, 7860, 13232 (SAM 32130); Cape west coast and north Atlantic Ocean; Id. PAH.

**Otolith shape:** Approximately ovate, elongating with growth. **Thickness:** Moderate. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Slightly rounded, rounded or flat; **sculpture**,

irregular. **Ventral margin:** Rounded, serrate or lobed. **Posterior margin:** Rounded or oblique and slightly irregular. **Sulcus acusticus:** Ostial, approximately heterosulcoid. **Colliculum:** Heteromorph, posterior more clearly visible. **Pseudocolliculum:** Present. **Ostium:** Elongate, slightly tilted dorsally. **Cauda:** Short, approximately oval. **Ostio-caudal differentiation:** Slightly ventrally constricted. **Ostium/cauda:** 1:0.8, 1:0.8, 1:0.9. **Collum:** Absent. **Crista superior:** Low ridge from ostium to mid-cauda, absent at caudal tip. **Crista inferior:** Poorly developed along entire sulcus. **Dorsal depression:** Shallow and oval over most of dorsal area. **Ventral depression:** Absent, shallow groove in mid-area. **Rostrum:** Moderate, broad, tip blunt. **Antirostrum:** Very small and rounded. **Excisura:** Moderate, notch shallow, angle wide.

***Ceratoscopelus warmingii*, SSF No. 86.9 PLATE 17**

**DISTRIBUTION:** Common off southern Africa, occurs in Atlantic (42°N-40°S), Indian Ocean (20°N - 45°S) and tropical/subtropical Pacific. Attains 81 mm.

**MATERIAL:** 3/20 (1.73-3.1 mm OD, 33.9-39.4 mm SL), PEM 1773, 1774, 1772; off Natal and SE Cape coasts; Id. PAH.

**Otolith shape:** Approximately ovate. **Thickness:** Moderate. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Rounded; **sculpture**, crenate or irregular. **Ventral margin:** Rounded and crenate or irregular in anterior half. **Posterior margin:** Rounded and slightly irregular. **Sulcus acusticus:** Ostial, approximately homosulcoid. **Colliculum:** Homomorph, elongate anterior colliculum, small posterior colliculum. **Pseudocolliculum:** Present, ridge-like. **Ostium:** Elongate, antero-dorsally angled and oval. **Cauda:** Short, rounded, poorly defined tip. **Ostio-caudal differentiation:** Slightly ventrally constricted. **Ostium/cauda:** 1:0.6, 1:0.6, 1:0.5. **Collum:** Absent. **Crista superior:** Low ridge from ostium to mid-cauda, poorly developed at caudal tip. **Crista inferior:** Poorly developed along entire sulcus. **Dorsal depression:** Shallow, covering most of dorsal area. **Ventral depression:** Absent, shallow groove near margin, continues around the posterior margin. **Rostrum:** Moderate, broad, tapers to point or sharply rounded tip. **Antirostrum:** Minute and rounded or absent. **Excisura:** Moderate, notch very shallow, angle wide.

***Diaphus brachycephalus*, SSF No. 86.13 PLATE 17**

**DISTRIBUTION:** Found in Agulhas current and off West coast in Agulhas Water pockets, broadly tropical distribution in Atlantic and Indo-Pacific. Attains 57 mm.

**MATERIAL:** 1/1 (1.59 mm OD, 30.9 mm SL), PEM 1761; south-east coast; Id. PAH.

**Otolith shape:** Rounded-ovate. **Thickness:** Moderate. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Rounded; **sculpture**, slightly irregular. **Ventral margin:** Rounded and crenate or dentate. **Posterior margin:** Rounded and approximately entire. **Sulcus acusticus:** Ostial, approximately heterosulcoid. **Colliculum:** Heteromorph, anterior colliculum approximately twice size of posterior. **Pseudocolliculum:** Present, ridge-like, longer than posterior colliculum. **Ostium:** Elongate, oval, sulcus slightly curved and angled slightly dorsally. **Cauda:** Short, oval. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:0.5. **Collum:** Absent. **Crista superior:** Low ridge from ostium to cauda, poorly developed at caudal tip. **Crista inferior:** Poorly developed along entire sulcus. **Dorsal depression:** Shallow, oval, covers most of dorsal area, wider over cauda. **Ventral depression:** Shallow and small depression under cauda. **Rostrum:** Short, very broad and rounded. **Antirostrum:** Small and pointed. **Excisura:** Moderate, notch very shallow, angle acute.



### *Diaphus effulgens*, SSF No. 86.16 PLATE 17

**DISTRIBUTION:** Off all coasts of southern Africa. In Atlantic (50°-17°N and 19°S to Subtropical Convergence) and Indo-Pacific Oceans. Attains 150 mm.

**MATERIAL:** 3/14 (2.4-5.9 mm OD, 32-109 mm SL), PEM 1756, 7881, 13291; southeast coast, Cape west coast and North Atlantic; Id. PAH.

**Otolith shape:** Rounded-ovate. **Thickness:** Moderate. **Form:** - **Mesial** slightly convex, - **Lateral** flat. **Lateral surface:** Dorso-ventral groove in all but smallest otolith (c. 2.4 mm OD). **Dorsal margin:** Rounded to flat and notched posteriorly; **sculpture**, slightly irregular. **Ventral margin:** Rounded and serrate. **Posterior margin:** Rounded, notched dorsally and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior colliculum considerably larger than posterior. **Pseudocolliculum:** Present, ridge-like. **Ostium:** Elongate, oval, slightly dorsally angled. **Cauda:** Short, oval, poorly defined posteriorly. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:0.8, 1:0.7, 1:0.5. **Collum:** Absent. **Crista superior:** Low ridge from mid-ostium to cauda, poorly developed at anterior ostium and caudal tip. **Crista inferior:** Poorly developed, but may be low ridge under cauda. **Dorsal depression:** Shallow, oval and elongate. **Ventral depression:** Shallow depression under posterior cauda. **Rostrum:** Short, broad and sharply rounded or pointed. **Antirostrum:** Small, broad and pointed. **Excisura:** Moderate, notch shallow, angle acute.

### *Diaphus garmani*, SSF No. 86.19 PLATE 17

**DISTRIBUTION:** Found over the east coast continental shelf/slope southwards to about 26°S. Atlantic (36°N-07°S), Indo-Pacific to Mexico. Attains 60 mm.

**MATERIAL:** 1/1 (3.4 mm OD, fish not measured), 0853H; off Solomon Islands; Id. W. Schwarzhangs.

**Otolith shape:** Approximately rounded-ovate or oval-ovate. **Thickness:** Moderate. **Form:** - **Mesial** flat, - **Lateral** slightly convex. **Dorsal margin:** Rounded; **sculpture**, lobed or irregular. **Ventral margin:** Rounded and crenate or irregular. **Posterior margin:** Rounded and crenate or irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior colliculum very large. **Pseudocolliculum:** Present, ridge-like. **Ostium:** Elongate, approximately rectangular, dorsal margin curved. **Cauda:** Short, square and well defined posteriorly. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:0.5. **Collum:** Absent. **Crista superior:** Low ridge from ostium to cauda, poorly developed at anterior ostium and caudal tip. **Crista inferior:** Poorly developed along entire sulcus. **Dorsal depression:** Shallow, covers most of dorsal area. **Ventral depression:** Absent, shallow groove in mid-area. **Rostrum:** Short, broad and sharply rounded. **Antirostrum:** Small and pointed. **Excisura:** Moderate, notch shallow, angle acute.

### *Diaphus hudsoni*, SSF No. 86.20 PLATE 17

**DISTRIBUTION:** From 18°S off our west coast to 27° S off our east coast. Circumglobally between Subtropical Convergence and about 50° S, (with northern extensions in eastern boundary currents). Attains 84 mm.

**MATERIAL:** 6/24 (3.5-5.7 mm OD, 52-90 mm SL), PEM 13932, 13934, 13921 (SAM 31851), 13988, 13984, 1757; Cape west coast and Natal; Id. PAH.

**Otolith shape:** Rounded-ovate. **Thickness:** Moderate. **Form:** - **Mesial** flat, - **Lateral** convex. **Dorsal margin:** Rounded becoming raised posteriorly with a papilla; **sculpture**, slightly irregular. **Ventral margin:** Rounded and serrate. **Posterior margin:** Rounded and slightly irregular. **Sulcus acusticus:** Ostial, approximately heterosulcoid. **Colliculum:** Approximately heteromorph,

anterior colliculum larger than posterior colliculum. **Pseudocolliculum:** Present, ridge-like. **Ostium:** Approximately oval, angled slightly dorsally. **Cauda:** Short, oval, poorly defined posteriorly. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:0.8, 1:1.1, 1:0.8, 1:0.8, 1:0.9, 1:0.9. **Collum:** Absent. **Crista superior:** Low ridge from ostium to mid-cauda, poorly developed at posterior caudal, absent at tip. **Crista inferior:** Poorly developed along entire sulcus. **Dorsal depression:** Shallow, large and oval covering most of dorsal area. **Ventral depression:** Absent, shallow groove in mid-area and margin depressed. **Rostrum:** Short, broad and sharply rounded or pointed. **Antirostrum:** Small and rounded or sharply rounded. **Excisura:** Moderate, notch shallow, angle acute or wide.

### *Diaphus jenseni*, SSF No. 86.21 PLATE 17

**DISTRIBUTION:** Taken once in this area at 33°48.8'S, 27°47.9'E: Indo-Pacific. Attains 50 mm.

**MATERIAL:** 1/1 (2.22 mm OD, 26.2 mm SL), PEM 1758; Eastern Cape; Id. PAH.

**Otolith shape:** Approximately ovate. **Thickness:** Moderate. **Form:** - **Mesial** approximately flat, - **Lateral** convex. **Dorsal margin:** Rounded; **sculpture**, crenate and slightly irregular. **Ventral margin:** Rounded, approximately crenate. **Posterior margin:** Rounded, slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, with large, low anterior colliculum. **Pseudocolliculum:** Present, low ridge close to posterior colliculum. **Ostium:** Elongate, oval and wide. **Cauda:** Short, broad and oval. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:0.5. **Collum:** Absent. **Crista superior:** Low ridge from ostium to cauda, poorly developed at anterior ostium and caudal tip. **Crista inferior:** Poorly developed along entire sulcus. **Dorsal depression:** Shallow, oval and elongate. **Ventral depression:** Absent. **Rostrum:** Short, broad and sharply rounded. **Antirostrum:** Minute and sharply rounded. **Excisura:** Moderate, notch very shallow, angle acute or wide.

### *Diaphus lucidus*, SSF No. 86.23 PLATE 18

**DISTRIBUTION:** In Agulhas current and off west coast in Agulhas pockets. Atlantic (40°N-38°S, but absent in Benguela Upwelling Region), also Indo-Pacific. Attains 118 mm.

**MATERIAL:** 6/8 (2.38-4.9 mm OD, 34.5-99 mm SL), PEM 1767, 1766, 13389, 13388, 7999, 12052; Cape south-west and east coasts and North Atlantic; Id. PAH.

**Otolith shape:** Rounded-ovate. **Thickness:** Moderate. **Form:** - **Mesial** slightly convex, - **Lateral** convex. **Dorsal margin:** Rounded; **sculpture**, crenate or irregular. **Ventral margin:** Rounded and serrate. **Posterior margin:** Rounded, notched postero-dorsal corner in large otoliths (c. 4.2 mm OD) and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, large anterior colliculum. **Pseudocolliculum:** Present, ridge-like. **Ostium:** Elongate, oval, sulcus extends along most of otolith. **Cauda:** Short, oval, angled dorsally and tip near posterior margin of otolith. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:0.5, 1:0.5, 1:0.5, 1:0.4, 1:0.5. **Collum:** Absent. **Crista superior:** Low ridge from ostium to cauda, poorly developed at anterior ostium and absent at caudal tip. **Crista inferior:** Poorly developed along entire sulcus. **Dorsal depression:** Shallow above crista. **Ventral depression:** Absent, shallow groove close to margin. **Rostrum:** Short, broad and sharply rounded. **Antirostrum:** Short and pointed or sharply rounded. **Excisura:** Moderate, notch shallow, angle acute.

### *Diaphus meadi*, SSF No. 86.26 PLATE 18

**DISTRIBUTION:** In upwelled waters off west coast at least to 21°S. A circumglobal convergence species (32-41°S), a variant form between 150° and 120°W. Attains 47 mm.



**MATERIAL:** 3/12 (2.8-3.7 mm OD, 36-48 mm SL), PEM 7590, 7592, 7593; North Atlantic; Id. PAH.

**Otolith shape:** Rounded-ovate. **Thickness:** Moderate. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Rounded, mid-margin raised and pointed; **sculpture,** slightly irregular. **Ventral margin:** Rounded and serrate. **Posterior margin:** Rounded and approximately entire. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph. **Pseudocolliculum:** Present, ridge-like, extends from neck to caudal tip. **Ostium:** Wide, approximately rectangular, drooped ventral wall, dorsal margin of sulcus curved. **Cauda:** Short broad and poorly defined posteriorly. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:0.6, 1:0.7, 1:0.7. **Collum:** Absent. **Crista superior:** Low ridge from ostium to mid-cauda, poorly developed at extremes, absent at tip. **Crista inferior:** Poorly developed along entire sulcus. **Dorsal depression:** Shallow, oval and large covering most of dorsal area. **Ventral depression:** Absent, shallow groove in mid-area. **Rostrum:** Short, broad and sharply rounded. **Antirostrum:** Small and rounded. **Excisura:** Moderate, notch shallow, angle acute.

#### *Diaphus metopoclampus*, SSF No. 86.27 PLATE 18

**DISTRIBUTION:** South of 29° S off west coast and 27° S off east coast. Mediterranean, Atlantic, Indo-West Pacific. Attains 75 mm.

**MATERIAL:** 3/4 (3.5-4.1 mm OD, 53-61.5 mm SL), PEM 7574, 7882, 0360H; North Atlantic; Id. PAH, AK.

**Otolith shape:** Rounded-ovate. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral slightly convex. **Dorsal margin:** Well rounded, may be peaked postero-dorsally with growth (c. 3.8 mm OD); **sculpture,** slightly irregular. **Ventral margin:** Rounded and serrate. **Posterior margin:** Rounded and crenate or slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior colliculum large. **Pseudocolliculum:** Present, ridge-like, extends along entire cauda. **Ostium:** Elongate, oval, sulcus slightly curved. **Cauda:** Short, oval. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:0.9, 1:0.7, 1:0.7. **Collum:** Absent. **Crista superior:** Low ridge from ostium to cauda, poorly developed at anterior ostium and caudal tip. **Crista inferior:** Poorly developed along entire sulcus. **Dorsal depression:** Shallow, oval, wider posteriorly. **Ventral depression:** Absent, shallow groove in mid-area. **Rostrum:** Large, broad and sharply rounded or pointed. **Antirostrum:** Small and rounded or sharply rounded to pointed. **Excisura:** Moderate, notch moderate, angle acute.

#### *Diaphus mollis*, SSF No. 86.28 PLATE 18

**DISTRIBUTION:** Off east, south and west coasts of southern Africa. Broadly tropical distribution in all major oceans. Attains 66 mm.

**MATERIAL:** 4/24 (1.7-3.6 mm OD, 28.3-69 mm SL), PEM 1759, 13288, 13289, 13383; Cape east and west coasts; Id. PAH.

**Otolith shape:** Rounded-ovate. **Thickness:** Moderate. **Form:** - Mesial flat, - Lateral slightly convex. **Dorsal margin:** Rounded or flat, slightly peaked posteriorly; **sculpture,** slightly irregular. **Ventral margin:** Rounded and serrate. **Posterior margin:** Rounded or angular and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph with a large anterior colliculum. **Pseudocolliculum:** Present, ridge-like, extending back from neck to posterior tip of colliculum. **Ostium:** Wide, oval. **Cauda:** Short, wide and oval. **Ostio-caudal differentiation:** Slightly ventrally constricted. **Ostium/cauda:** 1:0.6, 1:0.6, 1:0.7, 1:0.7. **Collum:** Absent. **Crista superior:** Low ridge from ostium to cauda, poorly developed at anterior ostium and caudal tip. **Crista inferior:** Poorly developed along entire sulcus. **Dorsal depression:** Large, shallow and oval. **Ventral depression:** Ab-

sent. **Rostrum:** Large, broad and sharply rounded or rounded. **Antirostrum:** Small and pointed or sharply rounded. **Excisura:** Moderate, notch very shallow, angle acute.

#### *Diaphus ostenfeldi*, SSF No. 86.30 PLATE 18

**DISTRIBUTION:** Off west coast northwards to about 23°S. A circumglobal convergence species (35°-48°S). Attains 110 mm.

**MATERIAL:** 2/2 (4.6, 4.9 mm OD, 85, 100 mm SL), PEM 13161 & 13160 (both SAM 32112); Cape west coast; Id. PAH.

**Otolith shape:** Rounded-obovate. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex to flat, - Lateral slightly convex. **Dorsal margin:** Rounded and raised anteriorly, slightly emarginate posteriorly; **sculpture,** slightly irregular. **Ventral margin:** Rounded and serrate. **Posterior margin:** Rounded to blunt, emarginate dorsally and slightly irregular. **Sulcus acusticus:** Ostio-caudal with crista superior reaching postero-dorsal margin, heterosulcoid. **Colliculum:** Heteromorph, anterior colliculum large. **Pseudocolliculum:** Present, ridge-like and elongate, extending along the length of the posterior colliculum. **Ostium:** Elongate, approximately horizontal. **Cauda:** Slightly flexed dorsally, reaches postero-dorsal margin. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:0.7, 1:0.7. **Collum:** Absent. **Crista superior:** Poorly developed over anterior ostium, low ridge from mid-ostium to postero-dorsal margin. **Crista inferior:** Poorly developed along entire sulcus, absent at tip. **Dorsal depression:** Shallow and large. **Ventral depression:** Absent, shallow groove in mid-area. **Rostrum:** Large, broad and sharply rounded to pointed. **Antirostrum:** Small and pointed. **Excisura:** Moderate, notch shallow, angle acute.

#### *Diaphus perspicillatus*, SSF No. 86.32 PLATE 18

**DISTRIBUTION:** In Agulhas current and off west coast in Agulhas Water pockets. Broadly tropical species in Atlantic (45°N-36°S, but absent in south-eastern sector); Indo-Pacific. Attains 71 mm.

**MATERIAL:** 3/3 (1.9-2.6 mm OD, 22.1-39 mm SL), PEM 1763, 1762, 13292 (SAM 31826); southeast and Cape west coasts; Id. PAH.

**Otolith shape:** Approximately rounded-ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral convex. **Dorsal margin:** Rounded; **sculpture,** crenate or slightly irregular. **Ventral margin:** Rounded and serrate. **Posterior margin:** Rounded and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, large anterior colliculum. **Pseudocolliculum:** Present, ridge-like and elongate, extends from neck to caudal tip. **Ostium:** Broad, oval, dorsal margin of sulcus is sinuous. **Cauda:** Short, oval. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:0.5, 1:0.7, 1:0.6. **Collum:** Absent. **Crista superior:** Low ridge from ostium to cauda, poorly developed at extremes. **Crista inferior:** Poorly developed along entire sulcus. **Dorsal depression:** Shallow and oval. **Ventral depression:** Absent, shallow, narrow groove in mid-area. **Rostrum:** Short, broad and sharply rounded. **Antirostrum:** Small or minute and pointed. **Excisura:** Moderate, notch very shallow, angle acute or wide.

#### *Diaphus problematicus*, SSF No. 86.34 PLATE 19

**DISTRIBUTION:** In Agulhas current and off west coast in Agulhas Water pockets. Atlantic (40°N-39°S, but absent south of 13° in eastern sector) and tropical Indo-Pacific with extensions into higher latitudes in western boundary currents. Attains 105 mm.

**MATERIAL:** 1/1 (4.7 mm OD, 91 mm SL), PEM 13192 (SAM 32053); Cape west coast; Id. PAH.

**Otolith shape:** Obovate. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral convex. **Dorsal margin:** Rounded and raised anteriorly; **sculpture,** irregular. **Ventral**



**margin:** Rounded and serrate. **Posterior margin:** Blunt and narrow, emarginate dorsally and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph with low oblong anterior and oval posterior colliculum. **Pseudocolliculum:** Present, elongate but low, under entire posterior colliculum. **Ostium:** Elongate, oval, slightly flared, dorsal margin of sulcus is sinuous. **Cauda:** Oval, poorly defined posteriorly. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:0.5. **Collum:** Absent. **Crista superior:** Low ridge from ostium to mid-cauda, poorly developed or absent at caudal tip. **Crista inferior:** Poorly developed along entire sulcus. **Dorsal depression:** Shallow and oval. **Ventral depression:** Absent, shallow groove in mid-area. **Rostrum:** Short, moderately broad and sharply rounded. **Antirostrum:** Small and pointed. **Excisura:** Moderate, notch shallow, angle wide.

#### *Diaphus watasei*, SSF No. 86.41 PLATE 19

**DISTRIBUTION:** Over east coast continental shelf/slope southwards to about 30°S; on east African continental shelf south of about 02°S; west coast of Madagascar and off Japan. Attains 170 mm.

**MATERIAL:** 3/3 (5.6-8.1 mm OD, 110-162 mm SL), PEM 13026 (SAM 31657), 13027 (SAM 31658), 13025 (SAM 31656); Mozambique; Id. PAH.

**Otolith shape:** Obovate. **Thickness:** Moderately thin. **Form:** - Mesial flat, - Lateral slightly convex. **Lateral surface:** Dorso-ventral groove present. **Dorsal margin:** Rounded, distinctly notched posteriorly; **sculpture**, slightly or very irregular. **Ventral margin:** Rounded and serrate. **Posterior margin:** Rounded or oblique, notched dorsally and slightly irregular. **Sulcus acusticus:** Ostial, may appear ostio-caudal in uncoated otoliths, heterosulcoid. **Colliculum:** Heteromorph, large anterior colliculum. **Pseudocolliculum:** Present, elongate extends back from neck to at least posterior colliculum tip. **Ostium:** Elongate and approximately horizontal, with oblong colliculum which may protrude. **Cauda:** Oval, tilted slightly dorsally, ends very close to margin. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:0.6, 1:0.5, 1:0.6. **Collum:** Absent. **Crista superior:** Low ridge from ostium to mid-cauda, poorly developed at posterior cauda and absent at tip. **Crista inferior:** Poorly developed along entire sulcus. **Dorsal depression:** Elongate and shallow from mid-ostium to mid cauda, wider at caudal end. **Ventral depression:** Absent, margin depressed especially under anterior ostium. **Rostrum:** Short, moderately broad and sharply rounded to pointed. **Antirostrum:** Short, broad and pointed or rounded. **Excisura:** Moderate, notch shallow, angle acute.

#### *Electrona antarctica*, SSF No. 86.44 PLATE 19

**DISTRIBUTION:** Off the Cape and at 43°17'S, 48°55'E. Circumpolar distribution south of Antarctic Polar Front. Attains 103 mm. **MATERIAL:** 3/145 (2.05-2.4 mm OD, 62-77 mm SL), PEM 10227, 10220, 10225 (series 10223-10228 SAM 31192); Southern Ocean; Id. PAH.

**Otolith shape:** Tall and kidney-shaped. **Thickness:** Moderate. **Form:** - Mesial flat, - Lateral convex. **Lateral surface:** Nucleus distinctly raised. **Dorsal margin:** Rounded; **sculpture**, entire. **Ventral margin:** Rounded and entire. **Posterior margin:** Rounded or slightly emarginate and entire. **Sulcus acusticus:** Ostial, approximately homosulcoid. **Colliculum:** Heteromorph, anterior colliculum larger but both indistinct. **Pseudocolliculum:** Present, narrow, clearly separated from small posterior colliculum. **Ostium:** Very poorly defined, contains very low colliculum which may penetrate excisura. **Cauda:** Poorly defined, deeper than ostium, not filled by colliculum and pseudocolliculum. **Ostio-caudal differentiation:** Absent. **Ostium/cauda:** 1:1.2, 1:1.3, 1:1.1. **Collum:** Absent. **Crista superior:** Variable, may be either a low

rounded ridge, or poorly developed over ostium and cauda and absent at caudal tip. **Crista inferior:** Poorly developed to absent along entire sulcus. **Dorsal depression:** Shallow, oval covering most of dorsal area. **Ventral depression:** Depressed groove at margin. **Rostrum:** Short, very broad and rounded. **Antirostrum:** Short, very broad and rounded. **Excisura:** Moderate, notch very shallow, angle wide.

#### *Electrona carlsbergi*, SSF No. 86.45 PLATE 19

**DISTRIBUTION:** Upper 100m south of 50°S but below 550m in region of Subtropical Convergence. Not yet recorded off southern Africa. Circumglobal in subantarctic waters (40°-60°S). Attains 95 mm.

**MATERIAL:** 4/25 (3.2-3.5 mm OD, 70-79 mm SL), PEM 7672, 7665, 7662, 7677; North Atlantic; Id. PAH.

**Otolith shape:** Discoid. **Thickness:** Moderately thin. **Form:** - Mesial flat, - Lateral slightly convex. **Dorsal margin:** slightly rounded or flattened; **sculpture**, slightly irregular. **Ventral margin:** Rounded to well rounded and irregular or slightly lobed. **Posterior margin:** Rounded and slightly irregular. **Sulcus acusticus:** Ostial, approximately heterosulcoid. **Colliculum:** Homomorph, colliculi similar sized. **Pseudocolliculum:** Present, elongate, appears striated. **Ostium:** Oval, grooved indentation from excisura through colliculum. **Cauda:** Approximately oval, pseudocolliculum and narrow colliculum widely separated. **Ostio-caudal differentiation:** Slightly ventrally constricted. **Ostium/cauda:** 1:1.1, 1:1.1, 1:1, 1:1.2. **Collum:** Absent. **Crista superior:** Short, low ridge in neck area, poorly developed or absent at extremes and caudal tip. **Crista inferior:** Poorly developed along entire sulcus. **Dorsal depression:** Shallow, large and oval. **Ventral depression:** Absent, wide depression at margin. **Rostrum:** Short, broad and rounded. **Antirostrum:** Short, broad and rounded, usually same size as rostrum, but may be larger. **Excisura:** Moderately narrow, notch shallow, angle acute.

#### *Electrona risso*, SSF No. 86.47 PLATE 19

**DISTRIBUTION:** Off east and west coast of southern Africa. Widespread species in Atlantic (55°N-40°S), Mediterranean, Indian Ocean (0°-40°S), Tasman Sea and Cook Strait and eastern Pacific (42°N-20°S). Attains 82 mm.

**MATERIAL:** 4/17 (2.7-4.4 mm OD, 35-72 mm SL), PEM 13128, 13184, 13432, 13370; Cape west coast; Id. PAH.

**Otolith shape:** Discoid, may be somewhat tall. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral slightly convex. **Dorsal margin:** Rounded or flattened; **sculpture**, crenate. **Ventral margin:** Well rounded and crenate. **Posterior margin:** Rounded and crenate or slightly irregular. **Sulcus acusticus:** Ostial, approximately homosulcoid. **Colliculum:** Approximately homomorph, colliculi similar sized. **Pseudocolliculum:** Present, very close to, and as long as, posterior colliculum. **Ostium:** Approximately oval, poorly defined very low colliculum. **Cauda:** Approximately oblong, equal in width to ostium. **Ostio-caudal differentiation:** Slightly ventrally constricted. **Ostium/cauda:** 1:1, 1:1.3, 1:1.2, 1:1.1. **Collum:** Absent. **Crista superior:** Short, low ridge from mid-ostium to mid-cauda, poorly developed elsewhere, absent at caudal tip. **Crista inferior:** Poorly developed along entire sulcus but may have very low ridge under cauda. **Dorsal depression:** Shallow, oval and large. **Ventral depression:** Absent, shallow groove in mid-area. **Rostrum:** Short, broad and sharply rounded or pointed. **Antirostrum:** Short, broad and sharply rounded or pointed. **Excisura:** Moderate, notch shallow, angle acute.

#### *Gonichthys barnesi*, SSF No. 86.49 PLATE 19

**DISTRIBUTION:** Off east and west coasts south of 30°S. Convergence species in all three oceans (30°-40°S). Attains 50 mm.



**MATERIAL:** 2/2 (1.26, 1.44 mm OD, 39.9, 43 mm SL), PEM 1779, 3461; southeast and east coasts; Id. PAH.

**Otolith shape:** Approximately oval. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral slightly convex. **Dorsal margin:** Rounded; **sculpture**, entire. **Ventral margin:** Rounded and entire. **Posterior margin:** Rounded, may be angled and entire. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior colliculum larger than posterior, both very low and poorly defined. **Pseudocolliculum:** Present, may be poorly defined. **Ostium:** Oval, flaring slightly, narrowing to excisura, sulcus extends along most of otolith length. **Cauda:** Rectangular, poorly defined posteriorly. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:0.9, 1:1. **Collum:** Absent. **Crista superior:** Poorly developed along entire sulcus. **Crista inferior:** Short, low ridge under anterior ostium, poorly developed elsewhere. **Dorsal depression:** Absent. **Ventral depression:** Absent, area near margin slightly depressed. **Rostrum:** Very short, sharply rounded. **Antirostrum:** Small or short and rounded, may be longer than rostrum. **Excisura:** Moderate, notch very shallow, angle wide.

#### *Gymnoscopelus bolini*, SSF No. 86.51 PLATE 20

**DISTRIBUTION:** Circumglobal between Subtropical Convergence and Antarctic Polar Front. Attains 280 mm.

**MATERIAL:** 3/7 (7.9-8.5 mm OD, 212-260 mm SL), PEM 13087 (SAM 32153), 13374 (SAM 32157), 13144 (SAM 32152); Cape west coast; Id. PAH.

**Otolith shape:** Oblong-ovate to elongate. **Thickness:** Moderately thin. **Form:** - Mesial flat, - Lateral slightly convex. **Dorsal margin:** Flat, lobed posteriorly; **sculpture**, approximately entire. **Ventral margin:** Rounded and serrate. **Posterior margin:** Rounded and crenate or lobed. **Sulcus acusticus:** Ostial, approximately heterosulcoid, poorly defined ventrally. **Colliculum:** Heteromorph, anterior elongate and poorly defined. **Pseudocolliculum:** Absent. **Ostium:** Elongate, poorly defined ventral wall, colliculum lies ventrally. **Cauda:** Oval, colliculum tear-drop shaped. **Ostio-caudal differentiation:** Slight dorsal curve. **Ostium/cauda:** 1:0.5, 1:0.5, 1:0.8. **Collum:** Absent. **Crista superior:** Very low ridge from ostium to cauda, absent at caudal tip. **Crista inferior:** Poorly developed or absent along entire sulcus. **Dorsal depression:** Very shallow covering most of dorsal area. **Ventral depression:** Absent, broad, shallow groove at margin. **Rostrum:** Large, broad, slightly tapered, sharply rounded or pointed. **Antirostrum:** Short and sharply rounded. **Excisura:** Moderately wide, notch shallow, angle wide.

#### *Gymnoscopelus braueri*, SSF No. 86.52 PLATE 20

**DISTRIBUTION:** Circumglobal between Subtropical Convergence and Antarctic Continent. Attains 132 mm.

**MATERIAL:** 3/13 (2.4-3.0 mm OD, 86-126 mm SL), PEM 7545, 10253, 7544; Southern Ocean and North Atlantic; Id. PAH.

**Otolith shape:** Approximately ovate. **Thickness:** Moderate. **Form:** - Mesial flat, - Lateral slightly convex. **Dorsal margin:** Slightly rounded; **sculpture**, entire. **Ventral margin:** Rounded and entire. **Posterior margin:** Rounded or flattened and entire. **Sulcus acusticus:** Ostial, pseudo-archaesulcoid. **Colliculum:** Approximately heteromorph, larger anterior colliculum. **Pseudocolliculum:** Absent or extremely poorly defined and barely visible. **Ostium:** Oblong and poorly defined. **Cauda:** Approximately oval with small, round, poorly defined colliculum. **Ostio-caudal differentiation:** Absent. **Ostium/cauda:** 1:0.7, 1:0.7, 1:0.6. **Collum:** Absent. **Crista superior:** Rounded low ridge over anterior ostium, very poorly developed or absent elsewhere. **Crista inferior:** Absent under entire sulcus. **Dorsal depression:** Very shallow and oval. **Ventral depression:** Absent, very shallow groove from mid-area to margin. **Rostrum:** Large, broad and sharply

rounded. **Antirostrum:** Small, broad and sharply rounded. **Excisura:** Moderate, notch shallow, angle wide.

#### *Gymnoscopelus nicholsi*, SSF No. 86.53 PLATE 20

**DISTRIBUTION:** Not yet recorded off Southern Africa. Circumglobal between Subtropical Convergence and Antarctic Polar Front. Attains 161 mm.

**MATERIAL:** 3/24 (5.5-5.9 mm OD, 133-145 mm SL), PEM 10255, 7628, 7611; North Atlantic and Southern Ocean; Id. PAH.

**Otolith shape:** Oblong-ovate to elongate. **Thickness:** Moderate. **Form:** - Mesial flat, - Lateral slightly convex. **Dorsal margin:** Slightly rounded or flattened; **sculpture**, entire. **Ventral margin:** Rounded and serrate, crenate posteriorly. **Posterior margin:** Rounded and crenate or lobed. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior colliculum larger. **Pseudocolliculum:** Present, distinct ridge well separated from colliculum. **Ostium:** Elongate, has poorly defined ventral wall, with narrow, oblong colliculum. **Cauda:** Oval with narrow colliculum, poorly defined tip. **Ostio-caudal differentiation:** Slight dorsal curve. **Ostium/cauda:** 1:0.6, 1:0.6, 1:0.6. **Collum:** Absent. **Crista superior:** Very low ridge from ostium to mid-cauda, poorly developed posteriorly, absent at tip. **Crista inferior:** Poorly developed or absent along entire sulcus. **Dorsal depression:** Very shallow and oval covering most of dorsal area. **Ventral depression:** Absent, shallow groove at margin. **Rostrum:** Large, broad and pointed or sharply rounded. **Antirostrum:** Moderate and sharply rounded. **Excisura:** Moderate, notch moderately shallow, angle acute.

#### *Gymnoscopelus opisthopterus*, SSF No. 86.54 PLATE 20

**DISTRIBUTION:** Circumglobal south of Antarctic Polar Front but north to 40°S in western south Atlantic. Attains 162 mm.

**MATERIAL:** 1/1 (1.4 mm OD, 100 mm SL), PEM 11833; western Cape; Id. PAH.

**Otolith shape:** Tall and ear-shaped. **Thickness:** Moderate. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Rounded; **sculpture**, entire. **Ventral margin:** Rounded and entire. **Posterior margin:** Rounded and entire. **Sulcus acusticus:** Ostial, pseudo-archaesulcoid. **Colliculum:** Heteromorph, anterior colliculum larger than posterior. **Pseudocolliculum:** Present, short low ridge. **Ostium:** Has raised rectangular colliculum, walls poorly defined. **Cauda:** Approximately round raised colliculum, walls poorly defined. **Ostio-caudal differentiation:** Absent. **Ostium/cauda:** 1:0.7. **Collum:** Absent. **Crista superior:** Poorly developed to absent along entire sulcus. **Crista inferior:** Poorly developed to absent along entire sulcus. **Dorsal depression:** Very shallow, oval, covers most of dorsal area. **Ventral depression:** Absent, margin slightly depressed. **Rostrum:** Short, broad and rounded. **Antirostrum:** Absent or very short, broad and rounded. **Excisura:** Moderately wide, notch very shallow, angle wide.

#### *Gymnoscopelus fraseri*, SSF No. 86.55 PLATE 20

**DISTRIBUTION:** Not yet recorded from off southern Africa, but has been taken at 43°17'S, 48°55'E. Circumglobal between Subtropical Convergence and Antarctic Polar Front. Attains 88 mm.

**MATERIAL:** 1/1 (3.3 mm OD, 66 mm SL), PEM 7546; North Atlantic; Id. PAH.

**Otolith shape:** Oblong-ovate. **Thickness:** Moderate. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Flattened or slightly sinuate; **sculpture**, entire. **Ventral margin:** Rounded and entire. **Posterior margin:** Slightly rounded and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior elongate and larger than posterior. **Pseudocolliculum:** Present, low. **Ostium:** Elongate with poorly defined ventral walls and oblong low colliculum. **Cauda:** Short, oval with



poorly defined ventral wall with small, low, oval colliculum. **Ostio-caudal differentiation:** Slight ventral constriction. **Ostium/cauda:** 1:0.6. **Collum:** Absent. **Crista superior:** Very low ridge from anterior ostium to neck, poorly developed elsewhere. **Crista inferior:** Poorly developed to absent along entire sulcus. **Dorsal depression:** Very shallow over most of area. **Ventral depression:** Absent. **Rostrum:** Short, broad, angled to sharply rounded tip. **Antirostrum:** Small and sharply rounded. **Excisura:** Moderately wide, notch shallow, angle wide.

***Gymnoscopelus piabilis*, SSF No. 86.58 PLATE 20**

**DISTRIBUTION:** Off the west coast in Benguela Upwelling Region. A stranded specimen recorded from Cape southeast coast. Circumglobal between Subtropical Convergence and Antarctic Polar Front. Attains 146 mm.

**MATERIAL:** 4/34 (4.3-6.0 mm OD, 82-117 mm SL), PEM 13377, 13631, 13645, 13110 (SAM 31925); Cape west coast; Id. PAH.

**Otolith shape:** Oblong to oblong-ovate. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly convex. **Dorsal margin:** Slightly rounded; **sculpture,** slightly irregular. **Ventral margin:** Rounded and serrate. **Posterior margin:** Rounded and lobed. **Sulcus acusticus:** Ostial, approximately heterosulcoid. **Colliculum:** Heteromorph with elongate anterior colliculum. Colliculi overlap at neck. **Pseudocolliculum:** Present, low and narrow. **Ostium:** Elongate, oval colliculum has sinuous dorsal wall. **Cauda:** Short, oval with small colliculum. **Ostio-caudal differentiation:** Slight dorsal curve and may be slight ventral constriction. **Ostium/cauda:** 1:0.4, 1:0.6, 1:0.4, 1:0.4. **Collum:** Absent. **Crista superior:** Low ridge from ostium to cauda, absent at caudal tip. **Crista inferior:** Poorly developed along entire sulcus. **Dorsal depression:** Shallow elongate. **Ventral depression:** Absent, wide shallow groove close to margin. **Rostrum:** Short, broad and sharply rounded. **Antirostrum:** Minute or small and pointed or rounded. **Excisura:** Moderate, notch may be absent, if present, very shallow, angle acute or wide.

***Hygophum hanseni*, SSF No. 86.60 PLATE 21**

**DISTRIBUTION:** From 30°S on west coast to 33°S on east coast. Convergence species (30°S-43°S) in all three oceans. Attains 67 mm.

**MATERIAL:** 2/3 (1.4, 2.0 mm OD, 28.8, 38.2 mm SL), PEM 1775, 1776; south eastern Cape; Id. PAH.

**Otolith shape:** Rounded-ovate. **Thickness:** Moderate. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Rounded; **sculpture,** lobed or slightly irregular. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Rounded and entire. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph with large anterior, narrower posterior colliculum. **Pseudocolliculum:** Present, distinct, well separated from colliculum, appears striated. **Ostium:** Approximately oval and short. **Cauda:** Short and oval with narrow colliculum and poorly defined posteriorly. **Ostio-caudal differentiation:** Slightly ventrally constricted. **Ostium/cauda:** 1:0.9, 1:1. **Collum:** Absent. **Crista superior:** Low ridge over ostium, poorly developed above cauda, absent at tip. **Crista inferior:** Poorly developed along entire sulcus. **Dorsal depression:** Shallow, oval, covers most of dorsal area. **Ventral depression:** Absent, may be a shallow groove close to margin. **Rostrum:** Large, broad and rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Moderate, notch shallow, angle wide.

***Hygophum hygomii*, SSF No. 86.61 PLATE 21**

**DISTRIBUTION:** Occurs west of Cape Peninsula and off east coast (25°-37°S). In Mediterranean, Atlantic (38°-20°N and 13°-40°S), Indian Ocean (24°-40°S) and Pacific (15°-20°S). Attains 68 mm.

**MATERIAL:** 3/11 (2.9-3.4 mm OD, 50-c. 58 mm SL), PEM 13385 & 13384 (both SAM 31809), 3437, [13386 & 13387 (both SAM 31809)]; Cape west and east coasts; Id. PAH.

**Otolith shape:** Discoid. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral convex. **Dorsal margin:** Rounded; **sculpture,** crenate. **Ventral margin:** Rounded and crenate. **Posterior margin:** Rounded and crenate or slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, large and broad anterior colliculum. **Pseudocolliculum:** Distinct, ridge-like. **Ostium:** Moderately broad with tear-drop shaped colliculum which may protrude through excisura and with crease above or through colliculum. **Cauda:** Small, with oval, narrow colliculum and curved elongate pseudocolliculum. **Ostio-caudal differentiation:** Slightly ventrally constricted. **Ostium/cauda:** 1:0.7, 1:0.8, 1:0.9. **Collum:** Absent. **Crista superior:** Low ridge from anterior ostium to cauda, poorly developed at extremes and absent at caudal tip. **Crista inferior:** Low ridge under ostium poorly developed under cauda. **Dorsal depression:** Oval, very shallow. **Ventral depression:** Absent, shallow groove in mid-area. **Rostrum:** Short, broad and sharply rounded. **Antirostrum:** Short, angular and pointed; may be similar sized or longer than rostrum. **Excisura:** Moderately wide, notch shallow, angle wide.

***Hygophum proximum*, SSF No. 86.62 PLATE 21**

**DISTRIBUTION:** Occurs south to about 37°S in Agulhas Current, Indian Ocean (25°N-10°S) and eastern Pacific (24°N-24°S). Attains 50 mm.

**MATERIAL:** 2/3, same No. (1.9, 2.9 mm OD, fish not measured), PEM 0928a & b; tropical eastern Pacific; Id. JEF.

**Otolith shape:** Discoid. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral slightly convex. **Dorsal margin:** Rounded; **sculpture,** crenate. **Ventral margin:** Well rounded and crenate. **Posterior margin:** Rounded and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, larger anterior colliculum, lengthens with growth. **Pseudocolliculum:** Present, ridge-like. **Ostium:** Approximately oblong with oblong colliculum. **Cauda:** Short, oblong. **Ostio-caudal differentiation:** Slightly ventrally constricted. **Ostium/cauda:** 1:0.5, 1:0.7. **Collum:** Absent. **Crista superior:** Low ridge from ostium to cauda, absent at caudal tip. **Crista inferior:** Low ridge under posterior ostium, poorly developed elsewhere. **Dorsal depression:** Shallow, oval and small. **Ventral depression:** Small, oval and shallow under cauda; very shallow groove in mid-area. **Rostrum:** Short, broad and sharply rounded. **Antirostrum:** Short and sharply rounded. **Excisura:** Moderate, notch shallow, angle acute.

***Kreffichthys anderssoni*, SSF No. 86.64 PLATE 21**

**DISTRIBUTION:** Taken at 43°17'S, 48°55'E, but not yet recorded from southern Africa. Circumglobal between Subtropical Convergence and Antarctic Divergence. Attains 71 mm.

**MATERIAL:** 3/27 (1.3-1.9 mm OD, 38-66mm SL), PEM 7646, 10247, 7655; Southern Ocean and North Pacific; Id. PAH.

**Otolith shape:** Discoid, kidney-shaped. **Thickness:** Moderate. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Rounded; **sculpture,** entire. **Ventral margin:** Rounded and entire. **Posterior margin:** Rounded and entire. **Sulcus acusticus:** Ostial, pseudoarchaesulcoid. **Colliculum:** Heteromorph with depressed colliculi. **Pseudocolliculum:** Present, may be indistinct. **Ostium:** Flared with deeply depressed colliculum and walls poorly defined. **Cauda:** Short, oval with depressed colliculum and poorly defined walls. **Ostio-caudal differentiation:** Absent. **Ostium/cauda:** 1:1.1, 1:1, 1:1. **Collum:** Present, low, between depressed colliculi. **Crista superior:** Absent. **Crista inferior:** Absent below ostium, poorly developed under cauda. **Dorsal depression:** Very shallow. **Ventral depression:** Very shallow. **Rostrum:** Short, broad and



rounded. **Antirostrum:** Absent or very short, broad and rounded. **Excisura:** Moderate, notch very shallow, angle wide.

***Lampadena chavesi*, SSF No. 86.66 PLATE 21**

**DISTRIBUTION:** Occurrence off southern Africa not substantiated. Atlantic (41°-26°N and 13°-33°S), Indian (25°-40°S) and Pacific (30°-40°S) Oceans. Attains 80 mm.

**MATERIAL:** 2/2 (3.7, 3.8 mm OD, 66, 67 mm SL), PEM 7989, 0264H; Atlantic; Id. PAH, AK.

**Otolith shape:** Ovale. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly convex. **Dorsal margin:** Flat or slightly emarginate, distinctly notched posteriorly; **sculpture,** slightly irregular. **Ventral margin:** Rounded and serrate. **Posterior margin:** Rounded or pointed, notched dorsally and irregular. **Sulcus acusticus:** Ostial, approximately heterosulcoid. **Colliculum:** Heteromorph, broader anterior colliculum. **Pseudocolliculum:** Present, elongate. **Ostium:** Approximately oval, colliculum may protrude through the excisura. **Cauda:** Elongate, colliculum narrow and poorly defined. **Ostio-caudal differentiation:** Slightly ventrally constricted. **Ostium/cauda:** 1:0.8, 1:0.9. **Collum:** Absent. **Crista superior:** Very low ridge over anterior ostium, poorly developed from mid-ostium to cauda, absent at caudal tip. **Crista inferior:** Poorly developed along entire sulcus but may be a low ridge under ostium. **Dorsal depression:** Shallow, oval, covers most of dorsal area. **Ventral depression:** Very shallow depression under cauda and shallow groove near margin. **Rostrum:** Large, broad and pointed. **Antirostrum:** Small, broad and sharply rounded. **Excisura:** Wide, notch shallow, angle acute.

***Lampadena luminosa*, SSF No. 86.68 PLATE 21**

**DISTRIBUTION:** In Agulhas Current. In all three oceans (20°N-20°S), but with extensions into higher latitudes in western boundary currents. Attains 200 mm.

**MATERIAL:** 2/2 (8.5, 8.6 mm OD, 150, 157 mm SL), PEM 13241 & 13242 (both SAM 32178); Cape west coast; Id. PAH.

**Otolith shape:** Posteriorly notched ovate. **Thickness:** Thin. **Form:** - Mesial flat, - Lateral slightly convex. **Dorsal margin:** Oblique or flat, deeply notched posteriorly; **sculpture,** crenate or irregular. **Ventral margin:** Rounded and serrate. **Posterior margin:** Rounded ventrally, deeply notched dorsally and dentate or crenate. **Sulcus acusticus:** Ostio-caudal, approximately heterosulcoid. **Colliculum:** Heteromorph, anterior colliculum elongate. **Pseudocolliculum:** Present, elongate and curved ridge. **Ostium:** Elongate, with narrow colliculum. **Cauda:** Short, with oval colliculum, opens to posterior notch. **Ostio-caudal differentiation:** Slight ventral constriction. **Ostium/cauda:** 1:0.6, 1:0.6. **Collum:** Absent. **Crista superior:** Very low ridge along entire sulcus. **Crista inferior:** Poorly developed under ostium, absent under cauda. **Dorsal depression:** Shallow and oval. **Ventral depression:** Under cauda and shallow wide groove in mid-area. **Rostrum:** Large, broad and pointed or sharply rounded. **Antirostrum:** Absent or minute and rounded. **Excisura:** Wide, notch very shallow, angle wide.

***Lampadena notialis*, SSF No. 86.69 PLATE 21**

**DISTRIBUTION:** Off east coast and Cape Peninsula; convergence species in all three oceans (30°-47°S). Attains 139 mm.

**MATERIAL:** 2/2 (5.0, 8.7 mm OD, 136, 145 mm SL), PEM 13147, 13146; Cape west coast; Id. PAH.

**Otolith shape:** Oval-ovate becoming more elongate with growth. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly convex. **Dorsal margin:** Slightly rounded becoming sinuate with posterior peak; **sculpture,** slightly irregular. **Ventral margin:** Rounded and serrate. **Posterior margin:** Rounded, oblique and entire becoming oblique, notched and ser-

rate (8.7 mm OD). **Sulcus acusticus:** Ostio-pseudocaudal or ostial in small otoliths (5 mm OD), approximately heterosulcoid. **Colliculum:** Heteromorph. **Pseudocolliculum:** Present, elongate and distinct. **Ostium:** Elongate, oval with long low colliculum. **Cauda:** Short, oval with small colliculum, posterior margin poorly defined. **Ostio-caudal differentiation:** Slightly ventrally constricted. **Ostium/cauda:** 1:0.9, 1:0.6. **Collum:** Absent. **Crista superior:** Low ridge from ostium to cauda, poorly developed or absent at caudal tip. **Crista inferior:** Poorly developed or absent along entire sulcus. **Dorsal depression:** Shallow and oval covering most of dorsal area. **Ventral depression:** Absent, shallow groove in mid-area. **Rostrum:** Short, broad and pointed or sharply rounded. **Antirostrum:** Minute and rounded. **Excisura:** Moderate, notch very shallow, angle wide.

***Lampadena speculigera*, SSF No. 86.71 PLATE 22**

**DISTRIBUTION:** Off west and southeast coasts. Atlantic (66°-35°N and 35°-48°S), Indian (30°-45°S) and Pacific (30°-45°S) Oceans. Attains 153 mm.

**MATERIAL:** 4/6 (4.8-5.8 mm OD, 120-151 mm SL), PEM 13134, 7564, 7562, 7831; north Atlantic; Id. PAH.

**Otolith shape:** Triangular-ovate. **Thickness:** Moderately thin. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Slightly rounded and may be raised posteriorly; **sculpture,** lobed or slightly irregular. **Ventral margin:** Rounded and crenate or serrate. **Posterior margin:** Flat, notched or slightly emarginate and irregular. **Sulcus acusticus:** Ostio-pseudocaudal becoming ostio-caudal as the margin becomes emarginate, heterosulcoid. **Colliculum:** Heteromorph, a large anterior colliculum. **Pseudocolliculum:** Present, elongate and curved. May be indistinct in some otoliths. **Ostium:** Elongate and oval with low colliculum, sulcus extends the otolith length. **Cauda:** Short, oval with small colliculum, posterior and ventral walls poorly defined. **Ostio-caudal differentiation:** Slightly ventrally constricted. **Ostium/cauda:** 1:0.6, 1:0.6, 1:0.6, 1:0.7. **Collum:** Absent. **Crista superior:** Low ridge from ostium to mid-cauda, poorly developed at posterior cauda and tip. **Crista inferior:** Very poorly developed under ostium, absent under cauda. **Dorsal depression:** Shallow, large and oval covering most of area. **Ventral depression:** Small depression under cauda and a shallow, broad groove close to margin. **Rostrum:** Large, broad, tapered and pointed or sharply rounded. **Antirostrum:** Minute and rounded. **Excisura:** Moderately wide, notch very shallow, angle wide.

***Lampanyctodes hectoris*, SSF No. 86.72 PLATE 22**

**DISTRIBUTION:** Commonest myctophid of Benguela upwelling region, also off southern Australia, New Zealand and Chile. Attains 61 mm.

**MATERIAL:** 3/103 (2.1-2.3 mm OD, 49-64 mm SL), PEM 7477, 7532, 7536; Cape west coast; Id. BR.

**Otolith shape:** Approximately rounded-ovate to oval-ovate. **Thickness:** Moderate. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Rounded; **sculpture,** slightly irregular. **Ventral margin:** Rounded and serrate. **Posterior margin:** Rounded and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph. **Pseudocolliculum:** Present, distinct and longer than posterior colliculum. **Ostium:** Elongate, moderately broad with low oblong colliculum. **Cauda:** Short and oval, ends near margin; small colliculum may be depressed. **Ostio-caudal differentiation:** Slight ventral constriction. **Ostium/cauda:** 1:0.7, 1:0.7, 1:0.6. **Collum:** Absent. **Crista superior:** Low ridge from ostium to mid-cauda, poorly developed above posterior cauda and tip. **Crista inferior:** Poorly developed along entire sulcus. **Dorsal depression:** Shallow and oval, covering most of area. **Ventral depression:** Absent, shallow groove near margin. **Rostrum:**



Short, very broad and pointed or blunt. **Antirostrum:** Small and sharply rounded. **Excisura:** Moderate, notch shallow, angle wide.

#### *Lampanyctus achirus*, SSF No. 86.73 PLATE 22

**DISTRIBUTION:** In southern Benguela Upwelling Region and off south and east coasts, north to about 31°S. Circumglobal from about Subtropical Convergence to south of Antarctic Polar Front with northern extensions to 21°S in eastern boundary currents. Attains 162 mm.

**MATERIAL:** 2/3 (1.0, 1.3 mm OD, c. 114, 115 mm SL), PEM 3436 (SAM 28666), 3455 (SAM 28669); east coast; Id. PAH.

**Otolith shape:** Tall and rectangular. **Thickness:** Moderately thick. **Form:** - Mesial concave, - Lateral convex. **Dorsal margin:** Slightly rounded; **sculpture**, entire. **Ventral margin:** Slightly rounded and entire. **Posterior margin:** Approximately flat and entire. **Sulcus acusticus:** Ostial, pseudo-archaesulcoid, sulcus very poorly defined. **Colliculum:** Heteromorph, low and poorly defined. **Pseudocolliculum:** Present, poorly defined, close or attached to colliculum. **Ostium and cauda:** Not differentiated, discernible only by colliculi. **Ostio-caudal differentiation:** Not constricted. **Ostium/cauda:** c. 1:1 (colliculi only). **Collum:** Absent. **Crista superior:** Poorly developed above ostium, absent elsewhere. **Crista inferior:** Poorly developed or absent along the sulcus length. **Dorsal depression:** Oval, large and very shallow. **Ventral depression:** Absent, groove very shallow close to margin. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Moderate, notch absent.

#### *Lampanyctus alatus*, SSF No. 86.74 PLATE 22

**DISTRIBUTION:** Off all southern African coasts; Atlantic (46°N-38°S), Indian Ocean (0°-39°S), southeast Asian seas (20°N-10°S) and east coast of Australia (to 34°S). Attains 61 mm.

**MATERIAL:** 3/4 (1.5-2.32 mm OD, 46-55 mm SL), PEM 13282 (SAM 31848), 3393 (SAM 28679), 3395 (SAM 28689); Natal and Cape west coast; Id. PAH.

**Otolith shape:** Approximately oval to obovate. **Thickness:** Moderate. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Rounded; **sculpture**, entire. **Ventral margin:** Rounded and entire. **Posterior margin:** Rounded and entire. **Sulcus acusticus:** Ostial, approximately heterosulcoid. **Colliculum:** Heteromorph, large anterior colliculum. **Pseudocolliculum:** Present. **Ostium:** Elongate with low colliculum. **Cauda:** Oval, short and flexed slightly dorsally. **Ostio-caudal differentiation:** Slightly ventrally constricted. **Ostium/cauda:** 1:0.7, 1:0.8, 1:0.7. **Collum:** Absent. **Crista superior:** Very low ridge from mid-ostium to mid-cauda, poorly developed at extremes. **Crista inferior:** Poorly developed the length of the sulcus. **Dorsal depression:** Small, oval and shallow above neck. **Ventral depression:** Absent. **Rostrum:** Short, broad and rounded or sharply rounded. **Rostrum and antirostrum** very similar in size. **Antirostrum:** Small, broad and sharply rounded. **Excisura:** Moderate, notch shallow, angle wide.

#### *Lampanyctus ater*, SSF No. 86.75 PLATE 22

**DISTRIBUTION:** Off all coasts of southern Africa. Atlantic (58°-17°N and 15°-40°S) and Indian Ocean (12°-44°S). Attains 129 mm.

**MATERIAL:** 3/8 (1.8-1.9 mm OD, 99-112 mm SL), PEM 7982, 13231 (SAM 32073), 13255 (SAM 32074); Cape west coast and Sargasso Sea; Id. PAH.

**Otolith shape:** Tall and rectangular. **Thickness:** Moderately thick. **Form:** - Mesial concave, - Lateral convex. **Dorsal margin:** Rounded or slightly flattened; **sculpture**, entire. **Ventral margin:** Slightly rounded or flat and entire. **Posterior margin:** Slightly rounded and entire. **Sulcus acusticus:** Ostial, may appear ostio-caudal, pseudo-archaesulcoid. **Colliculum:** Heteromorph, colliculi very poorly defined. **Pseudocolliculum:** Absent.

**Ostium and cauda:** Not differentiated, discernible only by colliculi. **Ostio-caudal differentiation:** Not constricted. **Ostium/cauda:** 1:1.1, 1:0.9, 1:0.6. **Collum:** Absent. **Crista superior:** Poorly developed or absent along entire sulcus. **Crista inferior:** Poorly developed or absent along entire sulcus. **Dorsal depression:** Absent. **Ventral depression:** Absent, may be a wide and shallow groove in mid-area. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Moderate, notch absent.

#### *Lampanyctus australis*, SSF No. 86.76 PLATE 22

**DISTRIBUTION:** Off all coasts of southern Africa. Circumglobal convergence species (33°-43°S, but with northern extension to about 27°S in eastern boundary currents. Attains 131 mm.

**MATERIAL:** 4/17 (1.32-2.82 mm OD, 42.6-103 mm SL), PEM 1748 (SAM 28326), 13263 (SAM 32059), 3493 (SAM 28652), 3483 (SAM 28650); off Transkei and Cape west coast; Id. PAH.

**Otolith shape:** Oval-obovate. **Thickness:** Moderate. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Slightly rounded, flattened or slightly emarginate; **sculpture**, entire. **Ventral margin:** Rounded and entire. **Posterior margin:** Rounded and entire. **Sulcus acusticus:** Ostial, approximately heterosulcoid. **Colliculum:** Heteromorph, elongate anterior colliculum. **Pseudocolliculum:** Present, extends anteriorly to below posterior tip of anterior colliculum. **Ostium:** Elongate with rectangular colliculum which may be slightly depressed in the centre. **Cauda:** Short and oval, pseudocolliculum distinct. **Ostio-caudal differentiation:** Slightly ventrally constricted. **Ostium/cauda:** 1:1, 1:0.6, 1:0.7, 1:0.7. **Collum:** Absent. **Crista superior:** Low ridge from ostium to cauda, absent at tip. **Crista inferior:** Poorly developed along entire sulcus. **Dorsal depression:** Oval, elongate. **Ventral depression:** Absent, may be a wide shallow groove near margin. **Rostrum:** Short, broad, rounded or sharply rounded usually slightly shorter or approximately the same size as antirostrum. **Antirostrum:** Short, narrow and sharply rounded, or angular. **Excisura:** Moderate, notch shallow, angle wide.

#### *Lampanyctus festivus*, SSF No. 86.77 PLATE 23

**DISTRIBUTION:** Off all southern African coasts. Atlantic (53°-18°N and 28°-40°S but with northern extension to 12°S in Benguela Current) and Indo-West Pacific. Attains 138 mm.

**MATERIAL:** 2/2 (3.5, 3.7 mm OD, 132, 185 mm SL), PEM 13376, 13250; Cape west coast; Id. PAH.

**Otolith shape:** Approximately discoid. **Thickness:** Moderate. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Slightly rounded or flattened; **sculpture**, entire. **Ventral margin:** Rounded and entire. **Posterior margin:** Rounded and entire. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph. **Pseudocolliculum:** Present, under neck and posterior cauda. **Ostium:** Elongate with rectangular colliculum lying ventrally. **Cauda:** Short and oval with circular or oval colliculum. **Ostio-caudal differentiation:** Slightly ventrally constricted. **Ostium/cauda:** 1:0.6, 1:0.6. **Collum:** Absent. **Crista superior:** Low ridge from ostium to cauda, poorly developed at extremes. **Crista inferior:** Poorly developed. **Dorsal depression:** Oval, most of dorsal area. **Ventral depression:** Absent, may be broad, shallow groove near margin. **Rostrum:** Very short, broad and rounded. **Antirostrum:** Short and broad, angles down to sharply rounded tip, usually slightly longer than rostrum. **Excisura:** Moderate, notch shallow, angle wide.

#### *Lampanyctus intricarius*, SSF No. 86.78 PLATE 23

**DISTRIBUTION:** In the southern Benguela Upwelling Region. Atlantic (65°-32°N and in region of Subtropical Convergence) and Indo-Pacific (in region of Subtropical Convergence, but with northern extensions to 18°S in eastern boundary currents). Attains 200 mm.



**MATERIAL:** 3/6 (1.6-3.2 mm OD, 99-156 mm SL), PEM 7984, 13343 (SAM 31950), 7825; North Atlantic and western Cape coast; Id. PAH.

**Otolith shape:** Approximately discoid. **Thickness:** Moderately thick. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Slightly rounded; **sculpture**, entire. **Ventral margin:** Rounded and entire. **Posterior margin:** Rounded and entire. **Sulcus acusticus:** Ostial, approximately heterosulcoid. **Colliculum:** Heteromorph. **Pseudocolliculum:** Present, lies under neck and anterior part of posterior colliculum. **Ostium:** Elongate with low rectangular colliculum. **Cauda:** Short and oval with small colliculum. **Ostio-caudal differentiation:** Slightly ventrally constricted. **Ostium/cauda:** 1:0.6, 1:0.7, 1:0.6. **Collum:** Absent. **Crista superior:** Low ridge from mid-ostium to mid-cauda, poorly developed at extremes. **Crista inferior:** Well developed from mid-ostium to mid-cauda, poorly developed at extremes. **Dorsal depression:** Oval, in mid-area. **Ventral depression:** Absent, may be wide, shallow groove near margin. **Rostrum:** Short, broad, and rounded, similar sized to antirostrum. **Antirostrum:** Short, broad and sharply rounded. **Excisura:** Moderate, notch shallow, angle wide.

#### *Lampanyctus lepidolychnus*, SSF No. 86.79 PLATE 23

**DISTRIBUTION:** Occurs off all coasts of southern Africa; circumglobal convergence species (23°-48°S). Attains 119 mm.

**MATERIAL:** 4/26 (0.9-2.4 mm OD, 37-98 mm SL), PEM 1745 (SAM 28327), 3496 (SAM 28642), 3394 (SAM 28654), 13211 (SAM 31915), [series 13207-13216 (SAM 31915)]; Transkei, eastern and western Cape coasts; Id. PAH.

**Otolith shape:** Approximately kidney-shaped and tall. **Thickness:** Moderately thick. **Form:** - Mesial slightly concave, - Lateral convex. **Dorsal margin:** Rounded to slightly rounded; **sculpture**, entire. **Ventral margin:** Rounded and entire. **Posterior margin:** Rounded or slightly flattened and slightly emarginate, entire. **Sulcus acusticus:** Ostio-pseudocaudal, may appear ostio-caudal, pseudo-archaesulcoid. **Colliculum:** Approximately heteromorph with larger, poorly defined anterior colliculum. **Pseudocolliculum:** Present but very poorly defined, may not be visible in juveniles. **Ostium and cauda:** Not clearly distinguishable except by indistinct colliculi. **Ostio-caudal differentiation:** Not constricted. **Ostium/cauda:** 1:1, 1:1, 1:1, 1:1.1. **Collum:** Absent. **Crista superior:** Well developed over ostium, poorly developed above cauda. **Crista inferior:** Poorly developed or absent along entire sulcus. **Dorsal depression:** Oval, shallow, covering most of area. **Ventral depression:** Absent, may be depressed margin. **Rostrum:** Short, very broad, rounded - similar in size to antirostrum. **Antirostrum:** Short and broad, rounded or sharply rounded. **Excisura:** Moderate, if present, notch very shallow and angle wide.

#### *Lampanyctus macdonaldi*, SSF No. 86.81 PLATE 23

**DISTRIBUTION:** Found west of Cape Peninsula. Atlantic (65°-47°N) and circumglobal between Subtropical Convergence and Antarctic Polar Front. Attains 160 mm.

**MATERIAL:** 2/14 (2.0, 2.5 mm OD, 98, 120 mm SL), PEM 13221 & 13224 (both SAM 31841), [series 13217-13224 (SAM 31841)]; Cape west coast; Id. PAH.

**Otolith shape:** Approximately ear-shaped, may appear somewhat discoid. **Thickness:** Moderately thick. **Form:** - Mesial slightly concave or flat, - Lateral convex. **Dorsal margin:** Rounded or flattened; **sculpture**, approximately entire. **Ventral margin:** Rounded and entire. **Posterior margin:** Rounded or slightly flattened and entire. **Sulcus acusticus:** Ostial, approximately heterosulcoid. **Colliculum:** Heteromorph, large anterior colliculum. **Pseudocolliculum:** Absent or very indistinct. **Ostium:** Walls poorly defined, colliculum raised and oblong, sulcus deep.

**Cauda:** Oval with oval colliculum. **Ostio-caudal differentiation:** Slightly dorsally constricted. **Ostium/cauda:** 1:1, 1:1.1. **Collum:** Absent. **Crista superior:** Well developed and rounded along entire sulcus. May be poorly developed in some. **Crista inferior:** Well developed below ostium, broad ridge from neck to cauda. In some, poorly developed under ostium. **Dorsal depression:** Oval, shallow lying mainly over cauda. **Ventral depression:** Wide depression at margin either shallow or deep. **Rostrum:** Very short, broad and rounded. **Antirostrum:** Absent. **Excisura:** Moderate, if present, notch shallow, angle very wide.

#### *Lampanyctus photonotus*, SSF No. 86.83 PLATE 23

**DISTRIBUTION:** Not yet recorded from southern Africa. In Atlantic (55°N-30°S, but absent in Benguela Upwelling Region) and off New Caledonia. Attains 85 mm.

**MATERIAL:** 3/4 (1.65-1.75 mm OD, 54-57 mm SL), 1333H, 1334H, 1331H; Sargasso Sea; Id. PAH.

**Otolith shape:** Approximately obovate or oval. **Thickness:** Moderate. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Slightly rounded or flattened and slightly emarginate; **sculpture**, slightly irregular. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Rounded and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph. **Pseudocolliculum:** Present, short ridge. **Ostium:** Elongate, dorsal and ventral walls parallel with oblong colliculum. **Cauda:** Short and oval with smaller oval colliculum. **Ostio-caudal differentiation:** Slightly ventrally constricted. **Ostium/cauda:** 1:0.6, 1:0.7, 1:0.5. **Collum:** Absent. **Crista superior:** Low ridge from ostium to mid-cauda, poorly developed at extremes. **Crista inferior:** Poorly developed along entire sulcus. **Dorsal depression:** Oval and shallow. **Ventral depression:** Absent, margin widely and shallowly depressed. **Rostrum:** Very short, very broad, rounded. **Antirostrum:** Short, broad and rounded, narrower but similar in length to rostrum. **Excisura:** Moderate, notch shallow, angle wide.

#### *Lampanyctus pusillus*, SSF No. 86.84 PLATE 23

**DISTRIBUTION:** Off all coasts of southern Africa. Bisubtropical species in all major oceans. Attains 43 mm.

**MATERIAL:** 1/1 (1.3 mm OD, 33 mm SL), PEM 7980 (SAM 29264); northern Atlantic; Id. PAH.

**Otolith shape:** Discoid. **Thickness:** Moderately thick. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Rounded; **sculpture**, entire. **Ventral margin:** Rounded and entire. **Posterior margin:** Rounded and entire. **Sulcus acusticus:** Ostio-pseudocaudal, approximately heterosulcoid. **Colliculum:** Heteromorph. **Pseudocolliculum:** Present, distinct and elongate from posterior colliculum to neck. **Ostium:** Elongate, with parallel walls and narrower than cauda, colliculum oblong. **Cauda:** Short with low and indistinct oval colliculum. **Ostio-caudal differentiation:** Slight ventral constriction. **Ostium/cauda:** 1:1.2. **Collum:** Absent. **Crista superior:** Low ridge from ostium to cauda, poorly developed at tip. **Crista inferior:** Poorly developed along entire sulcus. **Dorsal depression:** Oval, shallow and moderately large. **Ventral depression:** Absent, margin depressed. **Rostrum:** Short, broad and rounded. **Antirostrum:** Short, broad and rounded, similar in size to rostrum. **Excisura:** Moderate, notch very shallow, angle wide.

#### *Lampanyctus tenuiformis*, SSF No. 86.86 PLATE 24

**DISTRIBUTION:** Atlantic (17°N-10°S, including Gulf of Mexico), Indian Ocean (07°N-04°S) and tropical Pacific. Attains 153 mm.

**MATERIAL:** 2/3 (3.1, 3.5 mm OD, 134, 154 mm SL), PEM 13254, 13342; Cape west coast; Id. PAH.

**Otolith shape:** Approximately discoid. **Thickness:** Moderate. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Slightly



rounded or slightly flattened; **sculpture**, entire. **Ventral margin**: Rounded and entire. **Posterior margin**: Rounded and entire. **Sulcus acusticus**: Ostial, heterosulcoid. **Colliculum**: Heteromorph, anterior colliculum elongate and ventrally placed. **Pseudocolliculum**: Present, appears fused to anterior colliculum. **Ostium**: Elongate with oblong colliculum. **Cauda**: Short with oval colliculum. **Ostio-caudal differentiation**: Slightly ventrally constricted. **Ostium/cauda**: 1:0.7, 1:0.7. **Collum**: Absent. **Crista superior**: May be very low ridge over ostium, poorly developed over cauda and tip. **Crista inferior**: Poorly developed at extremes, very low ridge under posterior ostium. **Dorsal depression**: Oval and very shallow, covering most of area. **Ventral depression**: Absent, margin may be depressed. **Rostrum**: Short, broad, rounded or sharply rounded. **Antirostrum**: Short and broad and sharply rounded, similar size to rostrum. **Excisura**: Moderate, notch shallow, angle wide.

*Lampanyctus vadulus*, Hulley, 1981 SSF No. 86.—  
**PLATE 24**

**DISTRIBUTION**: Although not previously recorded from this area, recently recorded off the Cape west coast. Attains at least 10 cm SL.

**MATERIAL**: 2/2 (2.1, 2.9 mm OD, 91, 100 mm SL), PEM 13252 (SAM 31947), 13378 (SAM 31948); Cape west coast; Id. PAH.

**Otolith shape**: Oval to oblong-ovate. **Thickness**: Moderate. **Form**: - **Mesial** flat, - **Lateral** convex. **Dorsal margin**: Slightly flattened; **sculpture**, crenate or irregular. **Ventral margin**: Rounded and slightly irregular. **Posterior margin**: Slightly rounded or flat and oblique, crenate or irregular. **Sulcus acusticus**: Ostial, heterosulcoid. **Colliculum**: Heteromorph. **Pseudocolliculum**: Present, low, extending from mid-posterior colliculum to neck. **Ostium**: Elongate with indistinct colliculum. **Cauda**: Short and oval with low, indistinct colliculum. **Ostio-caudal differentiation**: Slightly ventrally constricted. **Ostium/cauda**: 1:0.7, 1:0.4. **Collum**: Absent. **Crista superior**: Low ridge from ostium to cauda, very poor to absent at extremes. **Crista inferior**: Poorly developed to absent along entire sulcus. **Dorsal depression**: Oval and shallow. **Ventral depression**: Absent. **Rostrum**: Moderate, broad and rounded. **Antirostrum**: Moderate, broad and sharply rounded, similar size to rostrum. **Excisura**: Moderate, notch shallow, angle wide.

*Lampichthys procerus*, SSF No. 86.90 **PLATE 24**

**DISTRIBUTION**: Off Cape Peninsula; circumglobal convergence species (32°-48°S), but with extensions into lower latitudes in eastern boundary currents. Attains 95 mm.

**MATERIAL**: 3/5 (3.3-3.6 mm OD, 85-94 mm SL), PEM 13228, 13227 & 13225 (all SAM 32002), [series 13225-13228 (SAM 32002)]; Cape west coast; Id. PAH.

**Otolith shape**: Oval-ovate. **Thickness**: Moderate. **Form**: - **Mesial** slightly convex, - **Lateral** convex. **Dorsal margin**: Slightly rounded; **sculpture**, entire to slightly irregular. **Ventral margin**: Rounded and slightly irregular. **Posterior margin**: Rounded and slightly crenate. **Sulcus acusticus**: Ostial, heterosulcoid. **Colliculum**: Heteromorph, low and elongate anterior colliculum. **Pseudocolliculum**: Present, low, short and indistinct. **Ostium**: Elongate, narrow colliculum ventrally placed. **Cauda**: Short and oval, slightly flared dorsally with oval colliculum. **Ostio-caudal differentiation**: Slightly dorsally curved. **Ostium/cauda**: 1:0.4, 1:0.4, 1:0.4. **Collum**: Absent. **Crista superior**: Low ridge from ostium to cauda, absent at tip. **Crista inferior**: Poorly developed along entire sulcus. **Dorsal depression**: Oval, very shallow and elongate. **Ventral depression**: Absent, shallow groove at margin. **Rostrum**: Short, broad and angled, pointed or sharply rounded. **Antirostrum**: Short, narrow

and sharply rounded. **Excisura**: Moderately wide, notch shallow, angle wide.

*Lobianchia dofleini*, SSF No. 86.92 **PLATE 24**

**DISTRIBUTION**: Off all southern African coasts. Mediterranean, Atlantic (50°N-40°S), Indian Ocean (23°-38°S), Tasman Sea and South Pacific (region of Subtropical Convergence). Attains 50 mm.

**MATERIAL**: 3/8 (2.3-5.3 mm OD, 31-62 mm SL), PEM 7548, 1771 (SAM 28357), 7841; North Atlantic and southeast Cape coast; Id. PAH.

**Otolith shape**: Rounded-ovate. **Thickness**: Moderate. **Form**: - **Mesial** flat, - **Lateral** convex. **Dorsal margin**: Rounded, may be raised in mid-section and emarginate posteriorly; **sculpture**, slightly irregular. **Ventral margin**: Rounded and serrate or dentate. **Posterior margin**: Rounded or slightly flattened and slightly irregular. **Sulcus acusticus**: Ostial, heterosulcoid. **Colliculum**: Heteromorph. **Pseudocolliculum**: Present, long and distinct, extending from posterior tip of posterior colliculum to neck. **Ostium**: Elongate, slightly flared dorsally, with low and rectangular colliculum. **Cauda**: Short, with oval and narrow colliculum. **Ostio-caudal differentiation**: Slightly ventrally constricted. **Ostium/cauda**: 1:0.7, 1:0.6, 1:0.7. **Collum**: Absent. **Crista superior**: Ridge-like from ostium to mid-cauda, poorly developed along posterior cauda and tip. **Crista inferior**: Poorly developed along entire sulcus. **Dorsal depression**: Oval, large, shallow, covering most of dorsal area. **Ventral depression**: Absent, margin may be broadly depressed. **Rostrum**: Short, broad, pointed or sharply rounded. **Antirostrum**: Short, narrow and pointed. **Excisura**: Moderate, notch shallow, angle acute.

*Lobianchia gemellarii*, SSF No. 86.93 **PLATE 24**

**DISTRIBUTION**: Occurs off all southern African coasts. World-wide in tropical/subtropical waters. Attains 100 mm.

**MATERIAL**: 3/15 (4.9-7.4 mm OD, 55-96 mm SL), PEM 7991 (SAM 29287), 7986 (SAM 29287), 7835 (SAM 29472); northern Atlantic; Id. PAH.

**Otolith shape**: Rounded-ovate. **Thickness**: Moderate. **Form**: - **Mesial** flat, - **Lateral** convex. **Dorsal margin**: Rounded, raised in mid-section, emarginate posteriorly; **sculpture**, slightly irregular. **Ventral margin**: Rounded dentate or serrate. **Posterior margin**: Slightly rounded and entire. **Sulcus acusticus**: Ostial, heterosulcoid. **Colliculum**: Heteromorph. **Pseudocolliculum**: Ridge-like, elongate, under the posterior colliculum and neck. **Ostium**: Elongate, slightly flared dorsally with rectangular colliculum. **Cauda**: Short, oval with narrow colliculum. **Ostio-caudal differentiation**: Slightly ventrally constricted. **Ostium/cauda**: 1:0.6, 1:0.7, 1:0.6. **Collum**: Absent. **Crista superior**: Low ridge from ostium to mid-cauda, poorly developed to tip. **Crista inferior**: Poorly developed along entire sulcus. **Dorsal depression**: Oval, large and shallow. **Ventral depression**: Absent, margin may be depressed. **Rostrum**: Short, broad and pointed. **Antirostrum**: Small and pointed or sharply rounded. **Excisura**: Moderate, notch shallow, angle acute.

*Metellectrona ventralis*, SSF No. 86.97 **PLATE 24**

**DISTRIBUTION**: West of Cape Peninsula in southern Benguela Upwelling Region; circumglobal subantarctic species (36°-51°S). Attains 107 mm.

**MATERIAL**: 3/10 (3.1-3.6 mm OD, 63-80 mm SL), PEM 13917, 13919, 13911; Cape west coast; Id. PAH.

**Otolith shape**: Discoid to rounded-ovate. **Thickness**: Moderate. **Form**: - **Mesial** flat, - **Lateral** convex. **Dorsal margin**: Slightly rounded; **sculpture**, crenate or lobed. **Ventral margin**: Rounded and crenate. **Posterior margin**: Rounded and crenate or lobed. **Sulcus acusticus**: Ostial, heterosulcoid. **Colliculum**: Hetero-



morph. **Pseudocolliculum**: Ridge-like, longer than posterior colliculum. **Ostium**: Bulbous posteriorly, narrowing anteriorly with indistinct oval colliculum. **Cauda**: Short and moderately wide, bulbous under pseudocolliculum with oval to rounded colliculum. **Ostio-caudal differentiation**: Ventrally constricted. **Ostium/cauda**: 1:0.8, 1:0.7, 1:0.8. **Collum**: Absent. **Crista superior**: Low ridge from mid-ostium to mid-cauda, poorly developed at extremes. **Crista inferior**: Poorly developed along entire sulcus. **Dorsal depression**: Oval, large and shallow. **Ventral depression**: Absent, margin slightly depressed. **Rostrum**: Large, broad, sharply rounded. **Antirostrum**: Small and sharply rounded. **Excisura**: Moderate, notch shallow, angle acute.

#### *Myctophum aurolaternatum*, SSF No. 86.99 PLATE 24

**DISTRIBUTION**: In Agulhas Current, south to about 31°S; from Sofala Bank to Gulf of Aden and in eastern Indian Ocean (05°-18°S), southeast Asian seas and equatorial Pacific. Attains 105 mm.

**MATERIAL**: 3/3 (2.1-3.9 mm OD, fish not measured), PEM 0918b, 0866H, 0918a; Mexico; Id. JEF.

**Otolith shape**: Approximately oblong-ovate. **Thickness**: Moderate. **Form**: - Mesial slightly convex, - Lateral convex. **Lateral surface**: Nucleus raised. **Dorsal margin**: Slightly rounded; sculpture, crenate. **Ventral margin**: Rounded and crenate. **Posterior margin**: Rounded and crenate or lobed. **Sulcus acusticus**: Ostial, heterosulcoid. **Colliculum**: Heteromorph. **Pseudocolliculum**: Present, low. **Ostium**: Elongate with rectangular colliculum. **Cauda**: Approximately rectangular with blunt tip and rectangular colliculum. **Ostio-caudal differentiation**: Slightly ventrally constricted. **Ostium/cauda**: 1:0.4, 1:0.3, 1:0.4. **Collum**: Absent. **Crista superior**: Low ridge from ostium to cauda, poorly developed at tip. **Crista inferior**: May be a low ridge under ostium, poorly developed or absent elsewhere. **Dorsal depression**: Oval, small and very shallow. **Ventral depression**: Absent, may be a groove in mid-area. **Rostrum**: Variable, usually large, broad, pointed or sharply rounded. **Antirostrum**: Moderate or small, pointed or sharply rounded. **Excisura**: Moderate, notch moderately shallow, angle acute.

#### *Myctophum nitidulum*, SSF No. 86.101 PLATE 25

**DISTRIBUTION**: In Agulhas current and off west coast in pockets of Agulhas Water. Atlantic (45°N-40°S), Indian Ocean (07°N-24°S) and Pacific (32°N-30°S, with extension to 40°N in Kuroshio Current). Attains 83 mm.

**MATERIAL**: 4/6 (1.6-2.9 mm OD, 35-69 mm SL), PEM 0518c, 0518b, 3469, 0518a; California and Transkei; Id. JEF, PAH.

**Otolith shape**: Angularly obovate. **Thickness**: Moderate. **Form**: - Mesial slightly convex, - Lateral slightly convex. **Dorsal margin**: flattened, emarginate posteriorly; sculpture, irregular. **Ventral margin**: Rounded to well rounded and crenate or slightly irregular. **Posterior margin**: Rounded and crenate or slightly irregular. **Sulcus acusticus**: Ostial, heterosulcoid. **Colliculum**: Heteromorph. **Pseudocolliculum**: Present, distinct ridge. **Ostium**: Elongate, may be flared dorsally and sinuate ventrally with rectangular colliculum. **Cauda**: Short, square and dorsally flexed. **Ostio-caudal differentiation**: Ventrally constricted. **Ostium/cauda**: 1:0.6, 1:0.4, 1:0.5, 1:0.6. **Collum**: Absent. **Crista superior**: Low ridge from ostium to cauda, poorly developed or absent at tip. **Crista inferior**: Low ridge at neck, poorly developed elsewhere. **Dorsal depression**: Oval, small, lies over posterior ostium and neck. **Ventral depression**: Absent. **Rostrum**: Short, broad and pointed. **Antirostrum**: Oblique angle from dorsal margin, small and sharply rounded. **Excisura**: Moderate, notch shallow, angle wide or acute.

#### *Myctophum obtusirostre*, SSF No. 86.102 PLATE 25

**DISTRIBUTION**: In Agulhas Current and off west coast in pockets of Agulhas Water. Tropical waters of all oceans. Attains 85 mm.

**MATERIAL**: 1/1 (1.8 mm OD, 378 mm SL), PEM 1783 (SAM 28310); eastern Cape; Id. PAH.

**Otolith shape**: Approximately discoid. **Thickness**: Moderate. **Form**: - Mesial slightly convex, - Lateral convex. **Dorsal margin**: Flattened; sculpture, crenate anteriorly and slightly irregular. **Ventral margin**: Well rounded and crenate. **Posterior margin**: Rounded, lobed or irregular. **Sulcus acusticus**: Ostial, heterosulcoid. **Colliculum**: Heteromorph. **Pseudocolliculum**: Present, very low and indistinct. **Ostium**: Elongate, with oblong colliculum. **Cauda**: Short and rectangular with blunt tip and very low colliculum. **Ostio-caudal differentiation**: Slight ventral constriction. **Ostium/cauda**: 1:0.5. **Collum**: Absent. **Crista superior**: Ridge-like from ostium to cauda, poorly developed at tip. **Crista inferior**: Well developed in neck area, poorly developed elsewhere. **Dorsal depression**: Elongate and narrow. **Ventral depression**: Oval and small, lies below cauda. **Rostrum**: Small, broad and pointed. **Antirostrum**: Small and pointed. **Excisura**: Moderate, notch shallow, angle acute.

#### *Myctophum phengodes*, SSF No. 86.103 PLATE 25

**DISTRIBUTION**: Off all coasts of southern Africa. Southern subtropical waters of all three oceans. Attains 93 mm.

**MATERIAL**: 4/4 (2.01-3.6 mm OD, 39-75 mm SL), PEM 1780 (SAM 28305), 3388 (SAM 28682), 1781 (SAM 28313), 13290 (SAM 32042); Transkei and eastern Cape; Id. PAH.

**Otolith shape**: Discoid. **Thickness**: Moderate. **Form**: - Mesial slightly convex, - Lateral convex. **Dorsal margin**: Rounded; sculpture, crenate. **Ventral margin**: Rounded and crenate or slightly irregular. **Posterior margin**: Rounded and crenate. **Sulcus acusticus**: Ostial, heterosulcoid. **Colliculum**: Heteromorph. **Pseudocolliculum**: Present, distinct low ridge. **Ostium**: Elongate, moderately broad with oblong colliculum. **Cauda**: Short, rectangular with low colliculum. **Ostio-caudal differentiation**: Slightly ventrally constricted. **Ostium/cauda**: 1:0.5, 1:0.5, 1:0.6, 1:0.6. **Collum**: Absent. **Crista superior**: Low ridge from mid-ostium to mid-cauda, poorly developed at extremes. **Crista inferior**: May be a short, low ridge under part of ostium or poorly developed along entire sulcus. **Dorsal depression**: Shallow, oval, above neck. **Ventral depression**: Absent, margin widely depressed. **Rostrum**: Short, broad, sharply rounded. **Antirostrum**: Small and sharply rounded. **Excisura**: Moderate, notch very shallow, angle acute.

#### *Myctophum spinosum*, SSF No. 86.105 PLATE 25

**DISTRIBUTION**: In Agulhas Current and off west coast in Agulhas Water pockets; also in tropical/subtropical waters of Indo-Pacific. Attains 90 mm.

**MATERIAL**: 3/4 (1.3-2.1 mm OD, 34-c. 58 mm SL), PEM 1782, 3413 (SAM 28688), 3464 (SAM 28670); Transkei and eastern Cape; Id. PAH.

**Otolith shape**: Angular to discoid. **Thickness**: Moderately thin. **Form**: - Mesial slightly convex, - Lateral convex. **Dorsal margin**: flattened, angled anteriorly and posteriorly; sculpture, crenate and irregular. **Ventral margin**: Rounded to well rounded or angled and crenate or sinuate. **Posterior margin**: Sharply rounded and angled, crenate or slightly irregular. **Sulcus acusticus**: Ostial, heterosulcoid. **Colliculum**: Heteromorph. **Pseudocolliculum**: Present but low. **Ostium**: Elongate, dorsal wall narrows anteriorly and contains an oblong, low colliculum. **Cauda**: Slightly dorsally angled, short with dorsally positioned colliculum. **Ostio-caudal differentiation**: Slightly ventrally constricted. **Ostium/cauda**: 1:0.7, 1:0.5, 1:0.4. **Collum**: Absent. **Crista superior**: Very low



ridge from mid-ostium to mid-cauda, poorly developed at extremes. **Crista inferior:** Poorly developed along entire sulcus. **Dorsal depression:** Oval and narrow, lying above crista. **Ventral depression:** Absent, with very shallow groove in mid-area. **Rostrum:** Short, broad and sharply rounded. **Antirostrum:** Small, narrow and sharply rounded. **Excisura:** Moderate, notch shallow, angle acute.

***Notoscopelus caudispinosus*, SSF No. 86.107 PLATE 25**

**DISTRIBUTION:** In Agulhas Current south to 34°S. Broadly tropical species in Atlantic (42°N-37°S) and Indian (once at 07°56'S, 65°14'E) oceans, southeast Asian seas and off Hawaii. Attains 140 mm.

**MATERIAL:** 1/1 (4.3 mm OD, fish not measured), PEM 8000 (SAM 29245); North Atlantic; Id. PAH.

**Otolith shape:** Approximately oval-ovate or oblong. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral flat or slightly convex. **Lateral surface:** Shallow dorso-ventral groove may be visible. **Dorsal margin:** Rounded and may be notched posteriorly; **sculpture**, crenate to irregular. **Ventral margin:** Rounded, slightly crenate to irregular. **Posterior margin:** Sharply rounded and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph. **Pseudocolliculum:** Present, very short, half length of posterior colliculum. **Ostium:** Elongate with low, oblong colliculum. **Cauda:** Short, with oval colliculum. **Ostio-caudal differentiation:** Slightly ventrally constricted. **Ostium/cauda:** 1:0.4. **Collum:** Absent. **Crista superior:** Low ridge from ostium to mid-cauda, poorly developed posteriorly. **Crista inferior:** Poorly developed along entire sulcus. **Dorsal depression:** Oval, shallow and small, lying close to crista. **Ventral depression:** Absent, shallow groove in mid-area. **Rostrum:** Small, broad, angled with pointed tip. **Antirostrum:** Minute, narrow and pointed. **Excisura:** Moderate, notch very shallow, angle acute.

***Notoscopelus resplendens*, SSF No. 86.108 PLATE 25**

**DISTRIBUTION:** Occurs off all coasts of southern Africa. In Atlantic (47°N-Subtropical Convergence), Indian (24°-30°S) and Pacific (35°N-34°S) Oceans. Attains 95 mm.

**MATERIAL:** 2/3 (3.0-3.1 mm OD, 64-77 mm SL), PEM 13287 (SAM 32107), 13229 (SAM 32105); Cape west coast; Id. PAH.

**Otolith shape:** Oval to oblong-ovate. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral convex. **Dorsal margin:** Slightly rounded; **sculpture**, irregular. **Ventral margin:** Rounded and serrate. **Posterior margin:** Rounded and lobed or irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph. **Pseudocolliculum:** Present, low and shorter than posterior colliculum. **Ostium:** Elongate, slightly flared anteriorly with large, low and oblong colliculum. **Cauda:** Short with rectangular colliculum, anterior edge oblique. **Ostio-caudal differentiation:** Slightly ventrally constricted. **Ostium/cauda:** 1:0.4, 1:0.4. **Collum:** Absent. **Crista superior:** Low ridge from ostium to mid-cauda, poorly developed posteriorly. **Crista inferior:** Poorly developed along entire sulcus. **Dorsal depression:** Small, oval and shallow, lies above neck. **Ventral depression:** Absent, shallow groove in mid-area. **Rostrum:** Large, broad, angled with sharply rounded tip. **Antirostrum:** Small, narrow and sharply rounded. **Excisura:** Moderately wide, notch shallow, angle acute.

***Protomyctophum bolini*, SSF No. 86.112 PLATE 25**

**DISTRIBUTION:** Recorded from near southern Africa (41°40'-45°25'S, 17°17'-36°32'E). Circumglobal between Subtropical Convergence and Antarctic Divergence. Attains 67 mm.

**MATERIAL:** 2/2 (both 2.1 mm OD, 43 mm SL), PEM 10258, 10257; Southern Ocean; Id. PAH.

**Otolith shape:** Kidney-shaped. **Thickness:** Moderate. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Rounded; **sculpture**, entire. **Ventral margin:** Well rounded and entire. **Posterior margin:** Rounded, may have lobe in midline and entire. **Sulcus acusticus:** Ostial, heterosulcoid, ostium narrower than cauda. **Colliculum:** Heteromorph, both colliculi low and indistinct, anterior larger, posterior may be depressed. **Pseudocolliculum:** Distinct, rough ridge, very elongate, extends from posterior colliculum to posterior third of anterior colliculum. **Ostium:** Elongate, moderately narrow, walls poorly defined. **Cauda:** Wide with small colliculum. **Ostio-caudal differentiation:** Slightly ventrally constricted. **Ostium/cauda:** 1:1, 1:1. **Collum:** Absent. **Crista superior:** Absent along entire sulcus. **Crista inferior:** Poorly developed along entire sulcus. **Dorsal depression:** Absent. **Ventral depression:** Distal half of ventral area depressed. **Rostrum:** Short, very broad and rounded. **Antirostrum:** Short very broad and rounded. **Excisura:** Moderate, notch very shallow, angle wide.

***Protomyctophum normani*, SSF No. 86.116 PLATE 25**

**DISTRIBUTION:** Taken once off southern Africa (west of Slangkop lighthouse). Circumglobal convergence species (36°-43°S). Attains 56 mm.

**MATERIAL:** 1/1 (2.3 mm OD, 70 mm SL), PEM 7604 (SAM 30839); North Atlantic; Id. PAH.

**Otolith shape:** Irregular kidney-shaped. **Thickness:** Moderate. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Rounded; **sculpture**, entire. **Ventral margin:** Keeled, sinuate posteriorly and entire. **Posterior margin:** Rounded, slightly indented and sinuate ventrally and entire. **Sulcus acusticus:** Ostial, may appear ostio-caudal, heterosulcoid, cauda wider than ostium. **Colliculum:** Heteromorph, extremely low, poorly defined colliculi, posterior may have pits. **Pseudocolliculum:** Present, distinct elongate low ridge. **Ostium:** Very low colliculum, extends onto rostrum, very poorly defined. **Cauda:** Moderately long, wider than ostium. **Ostio-caudal differentiation:** Slightly ventrally constricted. **Ostium/cauda:** 1:0.7. **Collum:** Absent. **Crista superior:** Absent along entire sulcus. **Crista inferior:** Very low ridge under ostium, low rounded bulge under cauda. **Dorsal depression:** Absent, area flat. **Ventral depression:** Absent, very shallow groove near margin. **Rostrum:** Moderate, very broad and rounded. **Antirostrum:** Moderate, broad and rounded, similar sized to rostrum. **Excisura:** Moderate, notch moderately deep, angle acute.

***Protomyctophum tenisoni*, SSF No. 86.117 PLATE 26**

**DISTRIBUTION:** Not yet recorded from off Southern Africa. Circumglobal between Subtropical Convergence and Antarctic Polar Front. Attains 54 mm.

**MATERIAL:** 3/12 (1.5-1.8 mm OD, 40-49 mm SL), PEM 7603, 7598, 7600; North Atlantic; Id. PAH.

**Otolith shape:** Approximately kidney-shaped. **Thickness:** Moderate. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Slightly rounded; **sculpture**, slightly irregular. **Ventral margin:** Well rounded, may be slightly emarginate posteriorly and slightly irregular. **Posterior margin:** Slightly rounded or flattened and entire. **Sulcus acusticus:** Ostial, heterosulcoid, ostium narrower than cauda. **Colliculum:** Approximately heteromorph, very low and indistinct colliculi. **Pseudocolliculum:** Very distinct, nodular crest, extended towards posterior margin. **Ostium:** Moderately narrow and moderately elongate with low colliculum. **Cauda:** Moderately elongate and broad, bulbous under indistinct colliculum. **Ostio-caudal differentiation:** Slightly ventrally constricted. **Ostium/cauda:** 1:1.1, 1:1.2, 1:1.1. **Collum:** Absent. **Crista superior:** Absent along entire sulcus. **Crista inferior:** Poorly developed along entire sulcus. **Dorsal depression:** Absent, area flat. **Ventral depression:** Absent, may be a groove close to margin.



**Rostrum:** Short, broad, rounded. **Antirostrum:** Short, broad and rounded. **Excisura:** Moderate, notch shallow or moderate, angle wide.

*Scopelopsis multipunctatus*, SSF No. 86.118 PLATE 26

**DISTRIBUTION:** Off all coasts of southern Africa. In Atlantic and Indo-Pacific (25°S to Subtropical Convergence, but to 09°S in eastern boundary currents). Attains 81 mm.

**MATERIAL:** 3/19 (2.6-3.0 mm OD, c. 53-c. 61 mm SL), PEM 3545 (SAM 29114), 3495 (SAM 28664), 3466; northern Natal and Transkei; Id. PAH.

**Otolith shape:** Oval. **Thickness:** Moderate to moderately thin. **Form:** - Mesial slightly convex, - Lateral convex. **Dorsal margin:** Slightly rounded; **sculpture**, slightly irregular. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Rounded and slightly irregular. **Sulcus acusticus:** Ostial, pseudo-archaeosulcoid. **Colliculum:** Heteromorph, elongate anterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Elongate, distinguishable from cauda by low, elongate, oblong colliculum. **Cauda:** Has short and oval colliculum. **Ostio-caudal differentiation:** Absent, walls parallel. **Ostium/cauda:** 1:0.6, 1:0.4, 1:0.6. **Collum:** Absent. **Crista superior:** Very low ridge from ostium to cauda, absent at tip. **Crista inferior:** Poorly developed along entire sulcus. **Dorsal depression:** Oval and moderately large. **Ventral depression:** Absent, broad, shallow groove in mid-area. **Rostrum:** Very short, sharply rounded and angled, often slightly shorter than antirostrum. **Antirostrum:** Small, very narrow and angled to sharply rounded tip. **Excisura:** Moderate, notch very shallow, angle wide.

*Symbolophorus barnardi*, SSF No. 86.119 PLATE 26

**DISTRIBUTION:** Occurs off all coasts of Southern Africa. Atlantic (30°-40°S) and Indo-Pacific (30°S to Subtropical Convergence). Attains 116 mm.

**MATERIAL:** 6/25 (1.9-5.3 mm OD, 46-105 mm SL), PEM 13469, 13467 (SAM 31962), 13453 & 13458 (both SAM 31962), 13975, 12351; Cape west coast; Id. PAH.

**Otolith shape:** Oval-ovate becoming more oblong-ovate with growth. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral slightly convex. **Dorsal margin:** Slightly rounded or raised and flattened, may be notched; **sculpture**, crenate or irregular. **Ventral margin:** Rounded, crenate or irregular, smoother with growth. **Posterior margin:** Rounded and crenate or slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph. **Pseudocolliculum:** Distinct, under posterior colliculum. **Ostium:** Elongate, walls approximately parallel, contains oblong colliculum. **Cauda:** Short, slightly flexed dorsally, with rectangular colliculum. **Ostio-caudal differentiation:** Slightly ventrally constricted. **Ostium/cauda:** 1:0.6, 1:0.4, 1:0.4, 1:0.6, 1:0.4, 1:0.5. **Collum:** Absent. **Crista superior:** Low ridge from ostium to cauda, absent at tip. **Crista inferior:** Poorly developed along entire sulcus but may be a very low ridge under posterior ostium. **Dorsal depression:** Oval and shallow. **Ventral depression:** Absent, may be a very shallow groove in mid-area. **Rostrum:** Large, broad, sharply rounded. **Antirostrum:** Small or moderate and sharply rounded. **Excisura:** Moderate, notch moderately shallow, angle acute.

*Symbolophorus boops*, SSF No. 86.120 PLATE 26

**DISTRIBUTION:** In southern Benguela Upwelling Region north to 25°S. Circumglobal in and south of Subtropical Convergence. Attains 157 mm.

**MATERIAL:** 4/42 (2.6-6.0 mm OD, 50-129 mm SL), PEM 1787, 13982 (SAM 32014 or 32015), 13896 (SAM 32011), 13903; Cape west and east coasts; Id. PAH.

**Otolith shape:** Oval to oblong-ovate. **Thickness:** Moderate becoming moderately thin. **Form:** - Mesial slightly convex, - Lateral convex, becoming flat with growth. **Dorsal margin:** Rounded in juveniles (c. 2.6 mm OD) becoming slightly rounded and flattened; **sculpture**, crenate becoming slightly irregular (c. 4.9 mm OD). **Ventral margin:** Rounded and crenate in juveniles becoming slightly irregular (c. 4.9 mm OD). **Posterior margin:** Rounded and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid, cauda slightly wider than ostium. **Colliculum:** Heteromorph. **Pseudocolliculum:** Distinct. **Ostium:** Elongate with low, oblong colliculum. **Cauda:** Short with rounded or oval colliculum, posterior wall poorly defined. **Ostio-caudal differentiation:** Slightly ventrally constricted. **Ostium/cauda:** 1:0.4, 1:0.6, 1:0.5, 1:0.5. **Collum:** Absent. **Crista superior:** Ridge-like from ostium to mid-cauda, poorly developed or absent posteriorly. **Crista inferior:** Poorly developed along entire sulcus. **Dorsal depression:** Oval, shallow and large. **Ventral depression:** Absent, shallow groove in mid area. **Rostrum:** Short, broad, sharply rounded. **Antirostrum:** Minute (c. 2.6 mm OD) or small (3 mm OD) and rounded or sharply rounded. **Excisura:** Moderate, notch shallow, angle acute.

*Symbolophorus evermanni*, SSF No. 86.121 PLATE 26

**DISTRIBUTION:** In Agulhas Current, south to about 33°S; Tropical waters of Indo-Pacific. Attains 80 mm.

**MATERIAL:** 2/4 (2.75, 3.95 mm OD, fish not measured), 0834H, PEM 0522; Arabian Sea and Pacific Ocean; Id. AK, JEF.

**Otolith shape:** Approximately rounded-ovate. **Thickness:** Moderately thick. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Well rounded; **sculpture**, crenate or irregular. **Ventral margin:** Well rounded and crenate or slightly irregular. **Posterior margin:** Rounded and lobed. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph. **Pseudocolliculum:** Present, low, short and indistinct. **Ostium:** Elongate with parallel walls and a large, rectangular colliculum. **Cauda:** Short, slightly dorsally flexed and with an approximately square colliculum. **Ostio-caudal differentiation:** Slightly ventrally constricted. **Ostium/cauda:** 1:0.6, 1:0.4. **Collum:** Absent. **Crista superior:** Low ridge from ostium to posterior cauda, absent at tip. **Crista inferior:** Poorly developed along entire sulcus. **Dorsal depression:** Oval, large, covering most of area, deepest at crista. **Ventral depression:** Absent, groove near margin. **Rostrum:** Short, broad and sharply rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Moderate, notch very shallow, angle wide or acute.

*Symbolophorus rufinus*, SSF No. 86.122 PLATE 26

**DISTRIBUTION:** Not yet recorded from southern Africa. Atlantic (40°N-28°S) and equatorial Indian Ocean. Attains 94 mm.

**MATERIAL:** 1/1 (2.95 mm OD, fish not measured), 0842H; locality unknown; Id. W. Schwarzthans.

**Otolith shape:** Rounded-ovate. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral convex. **Dorsal margin:** Rounded and slightly emarginate posteriorly; **sculpture**, slightly irregular. **Ventral margin:** Rounded and crenate or slightly irregular. **Posterior margin:** Rounded and lobed. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph. **Pseudocolliculum:** Present and distinct. **Ostium:** Elongate, with rectangular, distinctly raised colliculum. **Cauda:** Oval, slightly flexed dorsally and distinctly raised, tear-drop shaped colliculum. **Ostio-caudal differentiation:** Slight ventral constriction. **Ostium/cauda:** 1:0.6. **Collum:** Absent. **Crista superior:** Distinct ridge from ostium to mid-cauda, poorly developed posteriorly. **Crista inferior:** Poorly developed along entire sulcus. **Dorsal depression:** Moderately deep near crista, covering most of area. **Ventral depression:** Absent, margin broadly depressed. **Ros-**



**trum:** Short, broad and sharply rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Moderate, notch shallow, angle acute.

***Taaningichthys bathyphilus*, SSF No. 86.123  
PLATE 26**

**DISTRIBUTION:** Off east coast (30°-33°S); widespread species in all three oceans (43°N-68°S). Attains 80 mm.

**MATERIAL:** 1/1 (1.71 mm OD, 50 mm SL), PEM 3489 (SAM 28677); northern Natal; Id. PAH.

**Otolith shape:** Approximately oval. **Thickness:** Moderate. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Rounded; **sculpture**, entire. **Ventral margin:** Rounded and entire. **Posterior margin:** Rounded and entire. **Sulcus acusticus:** Ostial, pseudo-archaeulcoid but sulcus poorly defined. **Colliculum:** Heteromorph, colliculi indistinct but anterior larger than posterior. **Pseudocolliculum:** Present, low and indistinct. **Ostium** and **cauda:** Shallow and poorly defined, differentiated only by colliculi. **Ostio-caudal differentiation:** Absent. **Ostium/cauda:** 1:0.6. **Collum:** Absent. **Crista superior:** Poorly developed along entire sulcus, absent at tip. **Crista inferior:** Poorly developed. **Dorsal depression:** Large, very shallow, covers most of area. **Ventral depression:** Small, oval and shallow. **Rostrum:** Short, broad, rounded. **Antirostrum:** Very short, broad and rounded. **Excisura:** Moderate, notch very shallow, angle wide.

**ORDER GADIFORMES**

**MORIDAE Nelson No. 171**

**Family characteristics:** Otoliths pyriform with distinct and raised, fused colliculi with appearance of mammalian spermatozoa.

**Key**

- 1a. Cauda strongly flexed ventrally . . . . . 2
- 1b. Cauda straight or slightly flexed . . . . . 3
- 2a. Caudal tip rounded to triangular; dorsal margin of otolith raised and well rounded; anterior colliculum short . . . . . *Laemonema globiceps* 90.3
- 2b. Caudal tip elongate oval; dorsal margin rounded, may be lobed; anterior colliculum elongate . . . . . *Physiculus natalensis* 90.8
- 3a. Cauda approximately straight, placed approximately in midline . . . . . 4
- 3b. Cauda slightly flexed, placed dorsal to midline . . . . . 5
- 4a. Tip of cauda not depressed and cup-like; anterior colliculum narrow; dorsal margin of otolith angled or slightly emarginate . . . . . *Antimora rostrata* 90.1
- 4b. Tip of cauda depressed and cup-like; anterior colliculum short and broad; dorsal margin of otolith approximately flat or slightly rounded . . . . . *Lepidion capensis* 90.5
- 5a. Anterior colliculum oval and broad; posterior colliculum is a low ridge behind anterior colliculum; small cup-like depression under tip of posterior colliculum which ends at tip of otolith . . . . . *Laemonema laureysi* 90.4
- 5b. Anterior colliculum elongate; posterior colliculum extends markedly out of the posterior tip of otolith; no cup-like depression under tip of posterior colliculum . . . . . 6
- 6a. Posterior colliculum is a well developed high ridge; dorsal margin of otolith high and raised; tip of posterior colliculum expanded, blob-like . . *Physiculus capensis* 90.7
- 6b. Posterior colliculum a low ridge; dorsal margin rounded and lower; tip of posterior colliculum elongate and narrow . . . . . *Tripterophycis gilchristi* 90.9

***Antimora rostrata*, SSF No. 90.1 PLATE 27**

**DISTRIBUTION:** Locally abundant. In most oceans, replaced by *A. microlepis* in North Pacific. Attains c. 75 cm.

**MATERIAL:** 6/25 (7.9-14.2 mm OD, 160-418 mm TL), PEM 13409, 14518 (RUSI 31377), 12256, 14604, 13406, 13667; Cape west coast; Id. MJS, PCH, PAH.

**Otolith shape:** Pyriform. **Thickness:** Thick. **Form:** - Mesial approximately flat, - Lateral convex. **Dorsal margin:** Straight; **sculpture**, sinuate. **Ventral margin:** Flat and entire to slightly irregular. **Posterior margin:** Pointed and notched. **Sulcus acusticus:** Caudal (may be termed caudal-incisive in other publications), heterosulcoid. **Colliculum:** Heteromorph. **Pseudo-colliculum:** Absent. **Ostium:** Colliculum raised, elongate and nodular, with slight dorsal flare at tip, close to margin, anterior wall not defined. **Cauda:** Narrow, widening and deeper towards posterior with narrow high colliculum which broadens at tip. **Ostio-caudal differentiation:** Absent. **Ostium/cauda:** 1:2.1, 1:1.7, 1:2.2, 1:1.9, 1:1.6, 1:1.7. **Collum:** Absent. **Crista superior:** Well developed, enveloping depression over ostium, ridge-like posteriorly. **Crista inferior:** Well developed under ostium, ridge-like towards posterior. **Dorsal depression:** Within crista superior, area slopes sharply to margin. **Ventral depression:** Absent, wall drops vertically. **Rostrum:** Absent, **pseudo-rostrum:** Elongate and pointed. **Antirostrum:** Absent, **pseudo-antirostrum:** Absent but colliculum protrudes. **Excisura:** Absent, **pseudo-excisura:** Wide, notch shallow.

***Laemonema globiceps*, SSF No. 90.3 PLATE 27**

**DISTRIBUTION:** Benthopelagic on continental shelf on south-western Cape coast. Attains c. 18 cm.

**MATERIAL:** 4/12 (7.9-9.4 mm OD, 155-165 mm SL), PEM 13790, 13663, 12282, 12283; Cape west coast; lodged in SAM.

**Otolith shape:** Pyriform. **Thickness:** Extremely thick. **Form:** - Mesial flat, - Lateral very convex. **Dorsal margin:** Rounded, emarginate and tapering at extremes; **sculpture**, entire. **Ventral margin:** Flat and entire. **Posterior margin:** Pointed and notched, entire. **Sulcus acusticus:** Caudal, heterosulcoid (caudal-incisive). **Colliculum:** Heteromorph. **Pseudocolliculum:** Absent. **Ostium:** Anterior wall poorly developed, colliculum elongate with central depression, nearly reaches margin. **Cauda:** Moderately deep groove, flaring dorsally with central raised, high colliculum with flared, rounded tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:2.4, 1:2.7, 1:2.4, 1:2.4. **Collum:** Absent. **Crista superior:** Absent over ostium, well developed at neck becoming ridge-like posteriorly, foreshortened. **Crista inferior:** Ridge-like from mid-ostium to end, enveloping V-shaped deep depression. **Dorsal depression:** Oval, moderately deep above crista, dorsal area overhangs cauda. **Ventral depression:** Deep, within crista inferior. **Rostrum:** Absent, **pseudo-rostrum:** Large and pointed. **Antirostrum:** Absent, **pseudo-antirostrum:** Small and rounded. **Excisura:** Absent, **pseudo-excisura:** Wide, notch shallow and wide.

***Laemonema laureysi*, SSF No. 90.4 PLATE 27**

**DISTRIBUTION:** Known only in eastern Atlantic, from Guinea to Namibia. Attains 30 cm.

**MATERIAL:** 2/2 (6.0, 8.6 mm OD, 176, 209 mm TL), PEM 14451 (RUSI 31381), 14452 (RUSI 31396); off Kunene River mouth; Id. RWL, MJS, PCH.

**Otolith shape:** Pyriform. **Thickness:** Very thick. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Rounded; **sculpture**, irregularly lobed. **Ventral margin:** Straight and margin entire, ventral wall irregular. **Posterior margin:** Pointed, notched and entire. **Sulcus acusticus:** Caudal, heterosulcoid (caudal incisive). **Colliculum:** Heteromorph. **Pseudocolliculum:** Absent. **Ostium:**



Wall poorly defined, colliculum oval and low with irregular surface. **Cauda:** Flares and deepens posteriorly, colliculum narrow and raised only from half way along cauda, with slightly broader tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:2.2, 1:2.2. **Collum:** Absent. **Crista superior:** Poorly developed over ostium, ridge-like over cauda, foreshortened. **Crista inferior:** Moderate under ostium, ridge-like from neck, enveloping deep ventral depression. **Dorsal depression:** Oval, fairly deep over crista. **Ventral depression:** Deep, V-shaped in cross section, within crista. Cup-like depression in ventral wall near posterior. **Rostrum:** Absent, **pseudo-rostrum:** Large, pointed and notched. **Antirostrum:** Absent, **pseudo-antirostrum:** Small and sharply rounded. **Excisura:** Absent, **pseudo-excisura:** Wide, notch shallow and angle acute.

#### *Lepidion capensis*, SSF No. 90.5 PLATE 27

**DISTRIBUTION:** Locally abundant, Cape to East London. Attains 50 cm.

**MATERIAL:** 5/81 (8.2-15.9 mm OD, 160-435 mm TL), PEM 13403, 13734, 13567, 13564, 13563, [14907-14911 (all RUSI 35609)]; Cape west coast; Id. MJS.

**Otolith shape:** Pyriform. **Thickness:** Thick. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Rounded; **sculpture,** irregular. **Ventral margin:** Flattened and irregular. **Posterior margin:** Pointed, notched and slightly irregular. **Sulcus acusticus:** Caudal, heterosulcoid (caudal incisive). **Colliculum:** Heteromorph. **Pseudocolliculum:** Absent. **Ostium:** Wall poorly defined, near margin, colliculum oval and nodular. **Cauda:** Deepening with marked bend in ventral wall near tip. Colliculum narrow, high, flaring at tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.8, 1:1.9, 1:1.7, 1:1.9, 1:1.7. **Collum:** Absent. **Crista superior:** Poorly developed but may be well developed over ostium in large otoliths. **Crista inferior:** Moderately well developed, especially posterior third, ridge-like at tip. **Dorsal depression:** Elongate and shallow from mid-ostium to dorsal margin. **Ventral depression:** Shallow within crista, to absent, area drops sharply. **Rostrum:** Absent, **pseudo-rostrum:** Large and pointed. **Antirostrum:** Absent, **pseudo-antirostrum:** Absent. **Excisura:** Absent, **pseudo-excisura:** Wide, notch shallow, angle wide.

#### *Physiculus capensis*, SSF No. 90.7 PLATE 27

**DISTRIBUTION:** Known only from Cape Peninsula to East London; common. Attains 18 cm.

**MATERIAL:** 5/25 (6.5-10.3 mm OD, 120-200 mm TL), PEM 14446 (RUSI 28366), 12467 (RUSI 28317), 14303, 14298, 14442 (RUSI 34136); Cape south and west coasts; Id. MJS, PCH.

**Otolith shape:** Pyriform. **Thickness:** Thick except posterior. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Domed; **sculpture,** slightly irregular. **Ventral margin:** Flat and slightly irregular. **Posterior margin:** Notched and sharply pointed. **Sulcus acusticus:** Caudal but may be ostio-caudal, heterosulcoid. **Colliculum:** Heteromorph. **Pseudocolliculum:** Absent. **Ostium:** Walls poorly defined, colliculum oval and pointed, may be very close to, or penetrate anterior margin. **Cauda:** Deepens and flares posteriorly, colliculum narrow and high, flaring at tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:2, 1:2, 1:2, 1:2, 1:1.8. **Collum:** Absent. **Crista superior:** Poorly developed over posterior ostium only, becomes well developed over cauda and foreshortened. **Crista inferior:** Ridge-like under posterior ostium, and cauda, enveloping ventral depression. **Dorsal depression:** Absent. **Ventral depression:** Within crista. **Rostrum:** Absent or small and sharply rounded, **pseudo-rostrum:** Pointed and narrow. **Antirostrum:** Absent, **pseudo-antirostrum:** Absent. **Excisura:** Absent, **pseudo-excisura:** Wide, notch shallow, angle wide.

#### *Physiculus natalensis*, SSF No. 90.8 PLATE 27

**DISTRIBUTION:** Off Natal; rare. Attains 24 cm.

**MATERIAL:** 3/3 (7.24-11.28 mm OD, 145-246 mm TL), PEM 5094, 5093, 5092; Kenya; Id. PCH.

**Otolith shape:** Pyriform. **Thickness:** Thick. **Form:** - Mesial flat, - Lateral convex. **Lateral surface:** Nodular. **Dorsal margin:** Lobed; **sculpture,** irregular. **Ventral margin:** Straight and irregular. **Posterior margin:** Pointed and irregular. **Sulcus acusticus:** Caudal but may be ostio-caudal, heterosulcoid (caudal incisive). **Colliculum:** Heteromorph. **Pseudocolliculum:** Absent. **Ostium:** Walls poorly defined, colliculum slightly raised, elongate and sharply rounded, may be close to, or penetrate the anterior margin. **Cauda:** Extremely deep, high undercut walls, flared posteriorly, colliculum high and narrow, strongly curved, with swollen tip. **Ostio-caudal differentiation:** Dorso-ventral constrictions. **Ostium/cauda:** 1:1.7, 1:1.9, 1:1.9. **Collum:** Absent. **Crista superior:** Absent over ostium, well developed over cauda and foreshortened. **Crista inferior:** Well developed from posterior ostium and under cauda, envelopes ventral depression. **Dorsal depression:** Absent. **Ventral depression:** Within crista complex. **Rostrum:** Absent or short and sharply rounded, **pseudo-rostrum:** Narrow and pointed. **Antirostrum:** Absent, **pseudo-antirostrum:** Absent. **Excisura:** Absent, **pseudo-excisura:** Wide, notch absent.

#### *Tripterophycis gilchristi*, SSF No. 90.9 PLATE 28

**DISTRIBUTION:** Off the Cape and Durban; rare. Attains 20 cm.

**MATERIAL:** 4/29 (5.5-8.3 mm OD, 110-221 mm TL), PEM 11284, 14154 (RUSI 28318), 11280, 12706 (RUSI 34071), [12705 (RUSI 34071), 14887 (RUSI 35557)]; Cape south and west coasts; Id. MJS, PCH.

**Otolith shape:** Pyriform and elongate. **Thickness:** Thick except posterior. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Raised; **sculpture,** slightly lobed or sinuate. **Ventral margin:** Straight and entire. **Posterior margin:** Narrow and pointed. **Sulcus acusticus:** Caudal, may be ostio-caudal, heterosulcoid (caudal incisive). **Colliculum:** Heteromorph. **Pseudocolliculum:** Absent. **Ostium:** Wall poorly defined, colliculum low, oval with shallow depression. **Cauda:** Narrow, deepens and flares posteriorly, with high undercut dorsal wall. Colliculum narrow relatively low, with swollen tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:2.6, 1:2.2, 1:2.3, 1:2.3. **Collum:** Absent. **Crista superior:** Poor over ostium, well developed from neck and foreshortened, contains depression. **Crista inferior:** Well developed from posterior of ostium, narrower and ridge-like under cauda, containing ventral depression. **Dorsal depression:** Shallow and oval within crista. **Ventral depression:** Oval, elongate and within crista complex. **Rostrum:** Absent or small and sharply rounded, **pseudo-rostrum:** Sharp and pointed. **Antirostrum:** Absent, **pseudo-antirostrum:** Absent. **Excisura:** Absent, **pseudo-excisura:** Wide, notch absent.

#### MELANONIDAE Nelson No. 172

**Family characteristics:** Otoliths rounded to rounded-triangular, up to at least 7 mm, homosulcoid, ostio-caudal openings and homomorph with two similar-sized colliculi.

##### Key

- 1a. Otolith approximately rounded or irregular; colliculi not distinctly raised . . . *Melanonus gracilis* 91.1
- 1b. Otolith becomes sharply triangular, tapered at anterior and posterior corners; colliculi raised . . . . . *Melanonus zugmayeri* 91.2



### *Melanonus gracilis*, SSF No. 91.1 PLATE 28

**DISTRIBUTION:** Circumantarctic, generally south of Subtropical Convergence. Attains c. 20 cm.

**MATERIAL:** 4/4 (1.3-2.1 mm OD, 41.6-75 mm SL), PEM 1733 (SAM 28407), 1732 (SAM 28399), 3389 (SAM 28739), 3450 (SAM 28736); off Transkei and southeastern Cape; Id. PAH.

**Otolith shape:** Discoid becoming irregular with growth (c. 2.1 mm OD). **Thickness:** Thin. **Form:** - **Mesial** flat, - **Lateral** flat or slightly convex. **Dorsal margin:** Rounded becoming sinuate; **sculpture**, entire. **Ventral margin:** Rounded and entire. **Posterior margin:** Rounded and entire. **Sulcus acusticus:** Ostio-caudal, homosulcoid. **Colliculum:** Homomorph, two rounded colliculi. **Pseudocolliculum:** Absent. **Ostium:** Poorly defined with anterior colliculum. **Cauda:** Poorly defined with posterior colliculum. **Ostio-caudal differentiation:** Slight dorsal constriction. **Ostium/cauda:** 1:1.2, 1:1.2, 1:1.2, 1:1.1. **Collum:** Absent. **Crista superior:** Poorly developed or absent. **Crista inferior:** Absent. **Dorsal depression:** Absent. **Ventral depression:** Absent. **Rostrum:** Very short, rounded. **Antirostrum:** Absent. **Excisura:** Narrow, no notch.

### *Melanonus zugmayeri*, SSF No. 91.2 PLATE 28

**DISTRIBUTION:** All three major oceans, generally north of Subtropical Convergence, but sometimes further south. Rare in this area. Attains c. 27 cm.

**MATERIAL:** 2/2 (2.45, 7.0 mm OD, c. 102, 240 mm SL), PEM 3465, 13373; off Natal and Cape west coast; Id. PAH.

**Otolith shape:** Discoid as small, becoming rounded triangular (by 7 mm OD). **Thickness:** Thin. **Form:** - **Mesial** flat, - **Lateral** flat. **Dorsal margin:** Domed; **sculpture**, lobed but round in small otoliths. **Ventral margin:** Rounded and entire. **Posterior margin:** Rounded to sharply rounded and entire. **Sulcus acusticus:** Ostio-caudal, homosulcoid. **Colliculum:** Homomorph, two similar-sized colliculi. **Pseudocolliculum:** Absent. **Ostium:** Low and flattened, walls poorly defined, contains small, round colliculum. **Cauda:** Flat, walls poorly defined with a small, oval colliculum and caudal opening very wide. **Ostio-caudal differentiation:** Slight dorsal constrictions. **Ostium/cauda:** 1:1.2, 1:1.1. **Collum:** Absent. **Crista superior:** Poorly developed along entire sulcus. **Crista inferior:** In centre only - poorly developed. **Dorsal depression:** Triangular and very shallow above neck. **Ventral depression:** Absent. **Rostrum:** Broad and sharply rounded. **Antirostrum:** Absent. **Excisura:** Wide, notch absent.

### BREGMACEROTIDAE Nelson No. 173

**Family characteristics:** Otoliths off-round, face-like. Sulcus homosulcoid, opening mesially with depressed homomorph colliculi and distinct pseudocolliculum.

#### Key

- 1a. Ventral margin of otolith flat; pseudocolliculum elongate, level with, and almost joins ostium and cauda; crista superior relatively short . . . . . *Bregmaceros nectabanus* 92.3
- 1b. Ventral margin of otolith slightly angled to midpoint; pseudocolliculum more ventrally placed than ostium and cauda; crista superior elongate . . . . . *Bregmaceros maclellandii* 92.2

### *Bregmaceros maclellandii*, SSF No. 92.2 PLATE 28

**DISTRIBUTION:** Circumtropical but not known from eastern Pacific; from the Cape eastwards. Attains 9.6 cm.

**MATERIAL:** 1/1 (2.45 mm OD, c. 65 mm SL), PEM 3458; off Natal; Id. PAH.

**Otolith shape:** Approximately hexagonal, face-like. **Thickness:** Thin. **Form:** - **Mesial** flat, - **Lateral** flat. **Dorsal margin:** Raised,

slightly emarginate in centre; **sculpture**, irregular. **Ventral margin:** Angular with central point, slightly irregular. **Posterior margin:** Rounded and irregular. **Sulcus acusticus:** Mesial, homosulcoid. **Colliculum:** Homomorph, two indented colliculi. **Pseudocolliculum:** Present - below and between ostium and cauda (nose-like). **Ostium:** Small, round and depressed. **Cauda:** Small, oval and depressed. **Ostio-caudal differentiation:** No constrictions. **Ostium/cauda:** 1:2.3. **Collum:** Present, slightly raised between ostium and cauda. **Crista superior:** Very poorly defined over cauda, absent over ostium. **Crista inferior:** Poorly developed. **Dorsal depression:** Slight elongate depression close to dorsal margin. **Ventral depression:** Absent. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

### *Bregmaceros nectabanus*, SSF No. 92.3 PLATE 28

**DISTRIBUTION:** Typically neritic known from the tropical E. Atlantic and Indo-West Pacific from the Cape eastwards. Attains 7.6 cm.

**MATERIAL:** 3/6 (1.2-1.3 mm OD, 47-51 mm TL), PEM 12783 (RUSI 28312), 12784 (RUSI 28313), 12782 (RUSI 28311); Cape south coast; Id. PCH.

**Otolith shape:** Irregular hexagon, face-like. **Thickness:** Thin. **Form:** - **Mesial** flat, - **Lateral** slightly convex to flat. **Dorsal margin:** Domed; **sculpture**, entire. **Ventral margin:** Slightly rounded to flat and slightly irregular. **Posterior margin:** Sinuate and entire. **Sulcus acusticus:** Mesial, homosulcoid. **Colliculum:** Homomorph, two indented colliculi. **Pseudocolliculum:** Present - nose-like, almost connecting ostium and cauda. **Ostium:** Rounded to short oval depression. **Cauda:** More elongate oval. **Ostio-caudal differentiation:** No constrictions. **Ostium/cauda:** 1:2.7, 1:2.6, 1:3.1. **Collum:** Present, flat, slightly higher than ostium and cauda. **Crista superior:** Very poorly developed. **Crista inferior:** Poorly developed, slightly raised towards cauda. **Dorsal depression:** Half oval and shallow towards dorsal margin, bounded by low ventral ridge. **Ventral depression:** Absent. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

### GADIDAE Nelson No. 174

**Family characteristics:** Otolith oblong, homosulcoid and has collum - only one species available.

### *Gaidropsarus capensis*, SSF No. 88.1 PLATE 28

**DISTRIBUTION:** Known only from Cape Town to East London. Attains at least 16 cm.

**MATERIAL:** 4/18 (1.7-3.7 mm OD, 61-194 mm TL), PEM 5602, 5206 (RUSI 13834), 6041, 5578; southeastern Cape; Id. MJS, PCH.

**Otolith shape:** Oblong. **Thickness:** Moderately thin. **Form:** - **Mesial** slightly convex, - **Lateral** slightly concave. **Dorsal margin:** Rounded; **sculpture**, slightly irregular. **Ventral margin:** Flat to slightly rounded, slightly irregular. **Posterior margin:** Sharply rounded and slightly irregular. **Sulcus acusticus:** Ostial, homosulcoid. **Colliculum:** No raised colliculi. **Pseudocolliculum:** Absent. **Ostium:** Elongate, triangular, flaring anteriorly. **Cauda:** Elongate, triangular, flaring posteriorly with rounded posterior wall. **Ostio-caudal differentiation:** Slight ventral constriction. **Ostium/cauda:** 1:1.1, 1:1.3, 1:0.9, 1:0.9. **Collum:** Low and wall-like. **Crista superior:** Well developed, may be ridge-like in larger otoliths. **Crista inferior:** Poor to very poor at extremes. **Dorsal depression:** Oval and shallow above collum. **Ventral depression:** Absent, but ventral groove in larger otoliths, near margin. **Rostrum:** Short, broad and sharply rounded. **Antirostrum:** Absent. **Excisura:** Moderate, notch absent to minute in larger otoliths.

## MERLUCCIIDAE Nelson No. 175

**Family characteristics:** Otoliths large (up to c. 32 mm OD) oblong, mesial, homosulcoid, homomorph with low, oval colliculi.

### Key

- 1a. Otolith margins not crenate; dorsal and ventral areas reduced and not grooved; sulcus opening ostial or ostio-caudal . . . . . *Macruronus capensis* 89.3
- 1b. Otolith margins crenate or lobed; dorsal and ventral area grooved; sulcus opening mesial . . . . . 2
- 2a. Otolith oblong; dorsal margin flat, not strongly emarginate . . . . . *Merluccius capensis* 89.4
- 2b. Otolith kidney shaped; dorsal margin emarginate . . . . . *Merluccius paradoxus* 89.5

### *Macruronus capensis*, SSF No. 89.3 PLATE 28

**DISTRIBUTION:** Known from a few examples trawled off the Cape; similar species are of commercial importance off South America and New Zealand. Attains 100+ cm.

**MATERIAL:** 2/2 (25.3, 26.3 mm OD, 1336H = 1070 mm TL), 1336H, PEM 14218; Eastern Cape; Id. PCH, GJBR.

**Otolith shape:** Oblong. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Approximately straight; **sculpture**, irregular. **Ventral margin:** Rounded, slightly irregular. **Posterior margin:** Rounded and entire. **Sulcus acusticus:** Ostial, becoming ostio-caudal in large otoliths, homosulcoid. **Colliculum:** Homomorph, two slightly raised colliculi. **Pseudocolliculum:** Absent. **Ostium:** Elongate, approximately oval, almost filled by colliculum with irregular surface, ostium covers almost 50% of otolith. **Cauda:** Elongate, approximately oval, almost filled by colliculum with rough surface, cauda covers almost 50% of otolith. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.1, 1:1.1. **Collum:** Absent. **Crista superior:** Absent over ostium, well developed over neck and anterior cauda only. **Crista inferior:** Poorly developed. **Dorsal depression:** Oval above neck. **Ventral depression:** Absent but shallow ventral groove near margin. **Rostrum:** Very large, broad and rounded. **Antirostrum:** Absent or minute. **Excisura:** Wide, notch absent.

### *Merluccius capensis*, SSF No. 89.4 PLATE 29

**DISTRIBUTION:** Caught from about 10°S along west African coast, over the Agulhas Bank possibly to Natal and Valdivia Bank. Attains 140 cm.

**MATERIAL:** 5/256 (2.3-32 mm OD, 49-850 mm TL), PEM 7347, 7335, 7798 (RUSI 28314), 7802, 6906, [7041 (RUSI 28315)]; Cape south and west coasts; Id. MJS, PCH, BR.

**Otolith shape:** Oblong. **Thickness:** Moderately thin. **Form:** - Mesial flat to slightly convex, - Lateral flat to slightly concave. **Dorsal margin:** Rounded and raised over cauda; **sculpture**, lobed in juveniles (<c. 0.4 mm), crenate in larger otoliths. **Ventral margin:** Slightly rounded, juveniles lobed, larger otoliths crenate. **Posterior margin:** Sharply rounded and lobed to crenate. **Sulcus acusticus:** Mesial (but may appear pseudo-ostial as grooves from margin may reach ostium), homosulcoid. **Colliculum:** Homomorph, two similar shaped colliculi. **Pseudocolliculum:** Absent. **Ostium:** Elongate, with oval slightly raised colliculum, almost horizontal. **Cauda:** Elongate, slightly raised irregular colliculum, shorter than cauda. **Ostio-caudal differentiation:** Slight dorsal, greater ventral constriction. **Ostium/cauda:** 1:1, 1:0.9, 1:0.8, 1:0.8, 1:0.8. **Collum:** Absent. **Crista superior:** Poorly developed, may be well developed in neck of larger otoliths. **Crista inferior:** Poorly developed. **Dorsal depression:** Shallow and oval, dorsal area grooved in crenate otoliths. **Ventral depression:** Absent, ventral groove may be present, ventral area grooved in

crenate otoliths. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

### *Merluccius paradoxus*, SSF No. 89.5 PLATE 29

**DISTRIBUTION:** Caught from Cape Frio at 18°S, (Namibia) to East London. Generally in deeper water (200-1000 m) than *M. capensis*. Attains 115 cm.

**MATERIAL:** 4/80 (5.0-26.4 mm OD, 94-720 mm TL), PEM 9740, 10639, 10611, 10614; Cape west and south coasts; Id. MJS, BR.

**Otolith shape:** Slightly kidney-shaped to oblong. **Thickness:** Moderately thin. **Form:** - Mesial flat to slightly convex, - Lateral flat to slightly concave. **Dorsal margin:** Raised posteriorly, slightly indented at midpoint; **sculpture**, crenate. **Ventral margin:** Straight to slightly rounded and crenate, may be entire along part of margin in large otoliths. **Posterior margin:** Sharply rounded and crenate. **Sulcus acusticus:** Mesial (may appear pseudo-ostial as grooves meet ostium), homosulcoid. **Colliculum:** Homomorph. **Pseudocolliculum:** Absent. **Ostium:** Elongate, flaring with slightly raised colliculum. **Cauda:** Approximately oval, colliculum irregular and shorter than cauda. **Ostio-caudal differentiation:** Slight dorsal, greater ventral constriction. **Ostium/cauda:** 1:0.8, 1:1, 1:0.9, 1:0.7. **Collum:** Absent. **Crista superior:** Poorly developed, well developed over neck, particularly in larger otoliths. **Crista inferior:** Poorly developed. **Dorsal depression:** Oval, large and shallow, area slightly grooved. **Ventral depression:** Absent, area slightly grooved. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

## MACROURIDAE Nelson No. 176

**Family characteristics:** Otolith large (to c. 22 mm) and moderately thick, oval or oblong with either a flattened, raised or cockscomb crest on the dorsal margin, ventral margin usually rounded. Sulcus usually homosulcoid, may be archaesusulcoid, generally horizontal or slightly angled dorsally. Sulcus openings either mesial or ostio-caudal, may be para-ostial. Colliculum either single fused or two homomorph colliculi.

**NOTE:** This family was recently revised by Iwamoto and Anderson (1994). The publication appeared after layout of text, tables and illustrations had been completed for this atlas and consequently name changes have resulted in some species being in neither numerical nor alphabetical order. In designating which side otoliths were from, when this was not specifically noted, it was assumed that the smaller colliculum is anterior and the anterior margin more blunt.

### Key

- 1a. Colliculi fused in elongate sulcus; pseudocolliculum absent . . . . . 2
- 1b. Colliculi not fused; pseudocolliculum may be present . . . . . 3
- 2a. Colliculi fused as a single structure; sulcus archaesusulcoid; opening para-ostial; dorsal margin of otolith cockscomb-like . . . . . *Trachyrinchus scabrus* 93.29
- 2b. Colliculi with waist in midpoint; sulcus homosulcoid; opening ostial; dorsal margin slightly rounded, emarginate and slightly irregular . . . . . *Caelorinchus quadricristatus* 93.
- 3a. Colliculi rounded, oval or kidney shaped . . . . . 4
- 3b. Colliculi elongate . . . . . 16
- 4a. Anterior colliculum rounded, posterior colliculum elongate; caudal tip tapered, pointed and slightly depressed; sulcus poorly defined; ostium and cauda end far from otolith margins; ventral margin of otolith rounded . . . . . *Trachonurus villosus* 93.28



- 4b. Colliculi approximately similar shaped, may be similar sized; caudal tip not tapered; sulcus well defined with either colliculi raised or cristae well developed, or both; ostium and cauda usually end close to margins . . . . . 5
- 5a. Dorsal margin of otolith distinctly raised, flat or slightly rounded in mid-margin . . . . . 6
- 5b. Dorsal margin of otolith rounded, slightly rounded, notched or lobed, not distinctly raised in mid-margin . . . . . 7
- 6a. Dorsal margin of otolith raised, oblique anteriorly and posteriorly; ventral margin rounded and entire; colliculi small, oval and indented; pseudocolliculum joins colliculi . . . . . *Bathygadus cottoides* 93.-
- 6b. Dorsal margin of otolith narrow and raised as a single oblong lobe; ventral margin rounded, crenate to cockscombed; colliculi homomorph, resemble spectacles; pseudocolliculum absent . . . . . *Mesobius antipodum* 93.18
- 7a. Colliculi similar, small, widely spaced and dumbbell-like; pseudocolliculum narrow and ridge-like, joins colliculi . . . . . *Gadomus capensis* 93.14
- 7b. Colliculi not widely spaced, not dumbbell-like; pseudocolliculum irregular if present . . . . . 8
- 8a. Ventral margin of otolith rounded, crenate and dorsal margin flat and one colliculum reduced and kidney-shaped, the other oval in shape . . . . . *Bathygadus melanobranchus* 93.2
- 8b. Ventral margin of otolith slightly irregular, not distinctly crenate, not with flat dorsal margin; colliculum not kidney shaped . . . . . 9
- 9a. One colliculum raised, the other depressed . . . . . 10
- 9b. Both colliculi similarly raised or depressed (i.e. almost identical) . . . . . 11
- 10a. Anterior colliculum slightly raised and flat; small posterior colliculum depressed and round; dorsal margin of otolith lobed to notched; ventral area of otolith with no groove on ventral margin; ventral margin of otolith slightly crenate . . . . . *Caelorhynchus matamua* 93.16
- 10b. Anterior colliculum depressed and irregular; posterior colliculum raised and irregular; dorsal margin of otolith rounded and slightly irregular; ventral area of otolith has distinct broad groove near margin; ventral margin of otolith entire . . . . . *Coryphaenoides subserulatus* 93.13
- 11a. Dorsal margin of otolith becomes distinctly lobed (c. 7mm OD); antirostrum broad and rounded . . . . . *Nezumia brevibarata* 93.19
- 11b. Dorsal margin of otolith irregular; antirostrum small or absent . . . . . 12
- 12a. Otolith approximately rhomboidal with rounded to bulbous ventral margin and wide ventral area; dorsal margin flattened and slightly irregular; shallow, broad dorsal area; sulcus opening mesial . . . . . *Lucigadus ori* 93.32
- 12b. Otoliths oval, oblong; dorsal margin not flattened; dorsal area not distinctly broad; sulcus openings usually ostial or ostio-caudal, may be mesial . . . . . 13
- 13a. Rostrum distinct, broad and rounded; dorsal depression shallow, large but not distinct, crista superior not ridge-like; colliculi oval, relatively poorly defined . . . . . *Nezumia umbracincta* 93.-
- 13b. Rostrum, if present, not distinct and broadly rounded; dorsal depression distinct and crista superior well developed to ridge-like; colliculi distinct, usually with raised margins . . . . . 14
- 14a. Sulcus opening ostial; rostrum short, sharply rounded, and relatively narrow; colliculi oval and depressed, anterior colliculum lies close to excisura; pseudocolliculum ventrally placed in sulcus; excisural notch present but shallow . . . . . *Nezumia micronychodon* 93.22
- 14b. Sulcus opening ostial or mesial; rostrum moderate, broad and rounded or absent; colliculi with slightly raised margins; pseudocolliculum in middle of sulcus or may be absent; no excisural notch . . . . . 15
- 15a. Sulcus opening ostial; rostrum moderate, broad and rounded; otolith narrow; pseudocolliculum in middle of sulcus; colliculi oval and raised; anterior colliculum lies relatively close to anterior margin . . . . . *Kuronezumia leonis* 93.21
- 15b. Sulcus opening mesial; rostrum absent; otolith broader; pseudocolliculum absent; colliculi oval, anterior slightly shorter than elongate posterior; anterior colliculum lies relatively far from anterior margin . . . . . *Caelorinchus kaiyomaru* 93.-
- 16a. At least one colliculum relatively far from anterior or posterior margins . . . . . 17
- 16b. Colliculi almost reach anterior and posterior margins . . . . . 19
- 17a. Colliculi moderately wide and approximately oblong . . . . . 18
- 17b. Colliculi narrow and elongate . . . . . 20
- 18a. Colliculi deeply depressed in centre; dorsal margins of otolith oblique anteriorly and posteriorly, mid-dorsal margin flattened, crenate or slightly irregular; dorsal area moderately broad . . . . . *Sphagemacurus pumiliceps* 93.27
- 18b. Colliculi not deeply depressed in centre; dorsal margin of otolith flat and lobed; dorsal area of otolith becomes reduced with growth . . . . . *Malacocephalus laevis* 93.17
- 19a. Sulcus narrow and elongate; colliculi elongate, oval, narrow and horizontal; dorsal area broad . . . . . *Ventrifossa nasuta* 93.31
- 19b. Sulcus broader; colliculi broader, small compared to sulcus but raised; dorsal area becomes reduced with growth . . . . . *Coryphaenoides striaturus* 93.12
- 20a. Otolith elongate and banana shaped; dorsal margin flattened, dorsal area reduced; ventral margin rounded . . . . . *Caelorinchus trunovi* 93.9
- 20b. Otolith oblong, elliptic, not banana shaped; dorsal margin of otolith angled and raised or flattened and very lobed; ventral margin rounded to well rounded . . . . . 21
- 21a. Ostium and cauda with different sized colliculi . . . . . 22
- 21b. Ostium and cauda with similar sized colliculi . . . . . 23
- 22a. Dorsal margin of otolith angled and lobed; dorsal depression shallow and s-shaped; pseudocolliculum small and indistinct . . . . . *Caelorinchus denticulatus* 93.7
- 22b. Dorsal margin of otolith approximately flat or slightly angled and crenate to lobed; dorsal depression distinct and shallow oval; pseudocolliculum is narrow and ridge-like . . . . . *Caelorinchus simorhynchus* 93.8
- 23a. Otolith approximately oblong; margins approximately entire; colliculi indistinct. . . . . *Caelorinchus karrerae* 93.-
- 23b. Otolith oval or approximately oval; dorsal margin crenate or lobed; colliculi distinct . . . . . 24

- 24a. Both ends of sulcus with notches or slits to margin; dorsal margin of otolith crenate to digitate; pseudocolliculum slightly nodular or absent . . . . . *Caelorinchus acanthiger* 93.4
- 24b. Both ends of sulcus without notches or slits; dorsal margin may be indented or raised and angled with distinct crenations; pseudocolliculum low and irregular . . . . . *Caelorinchus braueri* 93.5

***Bathygadus cottoides*, Günther, 1878, SSF No. 93.-**

**PLATE 29**

**DISTRIBUTION:** This newly described species was collected off the Cape west coast. Its distribution and maximum size as yet unrecorded, but attains at least 17.7 cm.

**MATERIAL:** 1/1 (2.7 mm OD, 177 mm TL), PEM 15351 (RUSI 38212); off St Helena Bay; Id. MEA.

**Otolith shape:** Approximately oval. **Thickness:** Moderate. **Form:** - Mesial slightly concave, - Lateral convex. **Dorsal margin:** Raised and slightly rounded; **sculpture**, entire. **Ventral margin:** Rounded and entire. **Posterior margin:** Oblique and entire. **Sulcus acusticus:** Mesial, homosulcoid. **Colliculum:** Homomorph, two similar, indented, oval colliculi. **Pseudocolliculum:** Present, low, between colliculi. **Ostium:** Distinguished only by the oval, depressed colliculum. **Cauda:** Distinguished only by the oval, depressed colliculum. **Ostio-caudal differentiation:** Absent. **Ostium/cauda:** 1:2.1. **Collum:** Absent. **Crista superior:** Absent. **Crista inferior:** Poor along entire sulcus. **Dorsal depression:** Very shallow above neck. **Ventral depression:** Elongate along ventral area. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

***Bathygadus melanobranchus*, SSF No. 93.2 PLATE 29**

**DISTRIBUTION:** Table Bay and Natal coast. Also on western North Atlantic and eastern Atlantic south of Irish coast. Attains 40 cm.

**MATERIAL:** 1/1 (15.3 mm OD, 770 mm TL), PEM 13440; Cape west coast; Id. PAH.

**Otolith shape:** Oblong to kidney-shaped. **Thickness:** Moderately thick. **Form:** - Mesial very slightly convex, - Lateral very slightly convex. **Dorsal margin:** Slightly emarginate; **sculpture**, crenate and lobed. **Ventral margin:** Rounded and crenate. **Posterior margin:** Rounded and crenate. **Sulcus acusticus:** Mesial, homosulcoid. **Colliculum:** Heteromorph. **Pseudocolliculum:** Absent. **Ostium:** Short with kidney-shaped colliculum with rugose surface, walls poorly developed except over anterior. **Cauda:** Elongate, sloping at 30 degrees, filled with colliculum, rugose surface. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:1.1. **Collum:** Absent. **Crista superior:** Poorly developed along entire sulcus. **Crista inferior:** Poorly developed, absent under cauda. **Dorsal depression:** Absent. **Ventral depression:** Absent. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

***Caelorinchus acanthiger*, SSF No. 93.4 PLATE 29**

**DISTRIBUTION:** Off Namibia to Cape Point and over Walvis Ridge and Discovery Tablemount. Attains 40 cm.

**MATERIAL:** 4/4 (8.5-12.2 mm OD, 233-402 mm TL, 92-150mm PAL), PEM 14504 (RUSI 31406), 14506, 14505 (RUSI 31390), 14687; Cape west coast; Id. MEA, TI.

**Otolith shape:** Approximately oval. **Thickness:** Moderately thick. **Form:** - Mesial approximately flat, - Lateral slightly convex. **Dorsal margin:** Raised; **sculpture**, crenate to large lobes. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Sharply rounded and irregular to lobed, with slit to sulcus. **Sulcus acusticus:** Ostio-caudal, but in small otoliths openings indistinct,

homosulcoid. **Colliculum:** Homomorph, two low colliculi, may be indented. **Pseudocolliculum:** Slightly nodular or absent. **Ostium:** Elongate, with colliculum, depressed in centre. **Cauda:** Elongate with colliculum, depressed in centre. **Ostio-caudal differentiation:** Slightly constricted ventrally. **Ostium/cauda:** 1:1.4, 1:1.6, 1:1.6, 1:1.3. **Collum:** Absent. **Crista superior:** Poor to well developed in centre only. **Crista inferior:** Poorly developed along entire sulcus. **Dorsal depression:** Most of dorsal area slightly depressed to margin with grooves forming finger-like projections in some otoliths. **Ventral depression:** Absent, ventral groove along margin. **Rostrum:** Small and sharply rounded to rounded in large otoliths. **Antirostrum:** Small and sharply rounded. **Excisura:** Narrow to moderate and slit-like, notch very shallow, angle acute.

***Caelorinchus braueri*, SSF No. 93.5 PLATE 29**

**DISTRIBUTION:** Common south of Angola and north to Mozambique. Attains 40 cm.

**MATERIAL:** 6/81 (8.1-13.4 mm OD, 218-400 mm TL, 65-141 mm PAL), PEM 13811 (RUSI 28304), 14211 (RUSI 28305), 14892 (RUSI 35586), 14884 (RUSI 35578), 13720, 14936; Cape south and west coasts; Id. MJS, PCH, TI, MEA.

**Otolith shape:** Irregular oval. **Thickness:** Moderately thick. **Form:** - Mesial approximately flat, - Lateral slightly convex. **Dorsal margin:** Raised, may be indented; **sculpture**, crenate in small otoliths (c. 8.5 mm OD), lobed (>8.5 mm OD). **Ventral margin:** Well rounded, slightly crenate or entire. **Posterior margin:** Sharply rounded and lobed. **Sulcus acusticus:** Ostio-caudal but caudal opening indistinct, homosulcoid. **Colliculum:** Homomorph, two similar shaped colliculi. **Pseudocolliculum:** Present, low and irregular. **Ostium:** Oval, filled with colliculum, depressed in centre. **Cauda:** Elongate, filled with colliculum, depressed in centre. **Ostio-caudal differentiation:** Very slight ventral constriction. **Ostium/cauda:** 1:1.6, 1:1.4, 1:1.3, 1:1.3, 1:1.3, 1:1.2. **Collum:** Absent. **Crista superior:** Poorly developed at extremes, well developed in centre. **Crista inferior:** Poorly developed along entire sulcus. **Dorsal depression:** Approximately semicircular. **Ventral depression:** Absent. **Rostrum:** Large, broad, sharply rounded. **Antirostrum:** Small and rounded or absent. **Excisura:** Moderate, notch shallow, angle acute.

***Caelorinchus simorhynchus*, Iwamoto & Anderson 1994 (previously known as *C. fasciatus*) SSF No. 93.8 PLATE 30**

**DISTRIBUTION:** Abundant off south coast to 550 m. Attains 50 cm.

**MATERIAL:** 7/75 (7.2-14.4 mm OD, 206-416 mm TL, 11394 = 69 mm PAL), PEM 11529, 8120 (RUSI 34163), 11392, 8119 (RUSI 34163), 11386, 11387, 11394, [8114-8121 (RUSI 34163)]; Cape south and west coasts; Id. MJS, TI, MEA.

**Otolith shape:** Approximately oblong. **Thickness:** Moderately thick. **Form:** - Mesial slightly convex, - Lateral approximately flat. **Dorsal margin:** Raised in small (c. 7 mm OD), lower in larger otoliths; **sculpture**, crenate and lobed. **Ventral margin:** Rounded, crenate in small, irregular or entire in large otoliths. **Posterior margin:** Sharply rounded and irregular to crenate. **Sulcus acusticus:** Mesial. In unprepared or digested otoliths, may appear ostio-caudal as walls not distinct, homosulcoid. **Colliculum:** Homomorph. **Pseudocolliculum:** Usually elongate and ridge-like, may be unclear. **Ostium:** Oval, short with colliculum, depressed in middle. **Cauda:** Elongate, horizontal, colliculum almost fills cauda, depressed in middle (colliculi may appear fused). **Ostio-caudal differentiation:** Very slight ventral constriction. **Ostium/cauda:** 1:2.3, 1:1.5, 1:2.0, 1:1.6, 1:1.8, 1:1.7, 1:2. **Collum:** Absent. **Crista superior:** Well developed over ostium, poor over cauda. **Crista inferior:** Poorly developed along entire sulcus.



**Dorsal depression:** Oval, shallow over centre. **Ventral depression:** Absent. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

*Caelorinchus denticulatus*, SSF No. 93.7 PLATE 30

**DISTRIBUTION:** Natal coast to Tanzania. Attains 27 cm.

**MATERIAL:** 4/16 (6.0-12.86 mm OD, 141-220 mm TL), PEM 11359 (RUSI 28302), 11358, 12869 (RUSI 28303), 12871, [14963-14965 (RUSI 35563)]; Mozambique and Cape east coast; Id. MJS, PCH, TI, MEA.

**Otolith shape:** Irregularly elliptic. **Thickness:** Moderate. **Form:** - Mesial flat to slightly convex, - Lateral flat. **Dorsal margin:** Rounded to domed; **sculpture**, crenate in smaller otoliths (c. 6 mm OD) becoming lobed. **Ventral margin:** Rounded and crenate, entire in mid-area. **Posterior margin:** Sharply rounded, crenate or lobed. **Sulcus acusticus:** Ostio-caudal, although juveniles have poorly defined openings and may appear mesial, homosulcoid (ostium smaller in size, similar shaped). **Colliculum:** Homomorph (similar in shape, different in size). **Pseudocolliculum:** Small and indistinct. **Ostium:** Short, with colliculum indented in centre. **Cauda:** Long, straight and horizontal, filled with colliculum, poorly defined wall. **Ostio-caudal differentiation:** Very slight ventral constriction. **Ostium/cauda:** 1:2.4, 1:2.5, 1:1.8, 1:2.0. **Collum:** Absent. **Crista superior:** Poorly developed to well developed in larger otoliths, along entire sulcus. **Crista inferior:** Poorly developed along entire sulcus. **Dorsal depression:** S-shaped, shallow, very shallow in juveniles. **Ventral depression:** Absent. **Rostrum:** Large and rounded. **Antirostrum:** Absent to very small. **Excisura:** Narrow, notch absent to very shallow, angle wide.

*Caelorinchus kaiyomaru* Arai & Iwamoto, 1979, SSF No. 93.- PLATE 30

**DISTRIBUTION:** Widely distributed in the southern hemisphere, off New Zealand, eastern Pacific, southwestern Atlantic (Cohen et al. 1990). Attains 430 mm TL.

**MATERIAL:** 1/1 (9.6 mm OD, 321 mm TL), PEM 14900 (RUSI 35585); off Cape Recife, 34°28.1'S 25°57.9'E; Id. TI.

**Otolith shape:** Oval to oblong. **Thickness:** Moderately thick. **Form:** - Mesial slightly convex, - Lateral slightly convex. **Dorsal margin:** Slightly rounded; **sculpture**, crenate to lobed, may be notched at midpoint. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Sharply rounded and crenate dorsally. **Sulcus acusticus:** Mesial, approximately homosulcoid. **Colliculum:** Homomorph, two colliculi. **Pseudocolliculum:** Absent. **Ostium:** Approximately oval, colliculi slightly depressed in centre. **Cauda:** Elongate, colliculum oval and slightly depressed in centre. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:1.2. **Collum:** Absent. **Crista superior:** A low ridge from mid-ostium to mid-cauda, poorly developed at extremes. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Shallow and large covering most of area. **Ventral depression:** Absent, shallow groove near margin. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

*Caelorinchus karrerae* Trunov, 1984, SSF No. 93.- PLATE 30

**DISTRIBUTION:** Widespread in southern hemisphere, from the Rio Grande Ridge, mid-Atlantic, southeast Atlantic, in the Indian Ocean from Walters Shoal and Ninety-East Ridge, Mascarene Ridge (Cohen et al. 1990, T.I. pers. comm. 1992). Attains at least 350 mm TL.

**MATERIAL:** 3/3 (6.9-7.5 mm OD; 239-246 mm TL), PEM 14468 (RUSI 31391), 14691, 14497 (RUSI 31395); Atlantic coast of southern Africa; Id. TI, MEA.

**Otolith shape:** Approximately oblong. **Thickness:** Moderately thick. **Form:** - Mesial slightly convex, - Lateral convex. **Dorsal margin:** Raised and rounded anteriorly, tapered posteriorly; **sculpture**, slightly irregular. **Ventral margin:** Slightly rounded and approximately entire. **Posterior margin:** Sharply rounded and entire. **Sulcus acusticus:** Ostial, homosulcoid. **Colliculum:** Approximately homomorph, anterior colliculum rounded and indented, posterior elongate and slightly depressed. **Pseudocolliculum:** Present in neck but low. **Ostium:** Elongate, approximately horizontal. **Cauda:** Elongate approximately horizontal, colliculum with irregular depressions. **Ostio-caudal differentiation:** Slightly constricted ventrally. **Ostium/cauda:** 1:1.4, 1:1.3, 1:1.3. **Collum:** Absent. **Crista superior:** Well developed along the length of sulcus, may be poor at caudal tip. **Crista inferior:** Moderately well developed along entire sulcus. **Dorsal depression:** Shallow and broad. **Ventral depression:** Absent, shallow groove near margin. **Rostrum:** Short, broad and rounded. **Antirostrum:** Minute or absent. **Excisura:** Moderate, notch absent.

*Caelorinchus quadricristatus* (Alcock, 1891) SSF No. 93.- PLATE 30

**DISTRIBUTION:** Off Kenya, Northern Indian Ocean and Andaman Sea (TI pers. comm. 1992). Attains at least 46 cm TL.

**MATERIAL:** 2/2 (16.96, 21.18 mm OD, 5074 = 460 mm TL, 1579H = 260 mm PAL), PEM 5074, 1579H; Kenya; Id. PCH.

**Otolith shape:** Oblong. **Thickness:** Moderately thick. **Form:** - Mesial slightly convex, - Lateral flat but irregular. **Dorsal margin:** Slightly rounded; **sculpture**, crenate and lobed. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Sharply rounded, slightly irregular. **Sulcus acusticus:** Caudal, homosulcoid. **Colliculum:** Homomorph, two similar colliculi, appear fused. **Pseudocolliculum:** Absent. **Ostium:** Elongate, at anterior wall a slight ridge angles up to meet margin, anterior wall not well defined. Large colliculum, depressed in middle, joins the posterior colliculum. **Cauda:** Elongate, opens dorsally, colliculum more elongate than anterior, depressed in centre. **Ostio-caudal differentiation:** Slight ventral constriction. **Ostium/cauda:** 1:1.2, 1:1.4. **Collum:** Absent. **Crista superior:** Well developed with broad, low surface along entire sulcus. **Crista inferior:** Poorly developed along entire sulcus. **Dorsal depression:** Present, just below dorsal margin. **Ventral depression:** Absent, ventral groove along margin. **Rostrum:** Absent, **pseudo-rostrum:** Large and sharply rounded. **Antirostrum:** Absent, **pseudo-antirostrum:** Absent. **Excisura:** Absent, **pseudo-excisura:** Narrow, notch absent.

*Caelorinchus trunovi* Iwamoto & Anderson, 1994 (previously *C. flabellispinis*) SSF No. 93.9 PLATE 30

**DISTRIBUTION:** Indian Ocean, off Mozambique. Attains at least 47.5 cm.

**MATERIAL:** 1/1 (16.4 mm OD, 428 mm TL), PEM 13042; Mozambique; Id. PCH.

**Otolith shape:** Oblong to banana shaped. **Thickness:** Moderately thick. **Form:** - Mesial slightly convex, - Lateral moderately convex. **Dorsal margin:** Slightly emarginate; **sculpture**, slightly irregular. **Ventral margin:** Rounded, irregular to crenate at posterior end. **Posterior margin:** Sharply rounded and irregular. **Sulcus acusticus:** Ostio-caudal but walls poorly defined, homosulcoid. **Colliculum:** Homomorph. **Pseudocolliculum:** Absent. **Ostium:** Elongate, with elongate colliculum, slightly depressed in middle, not joined to posterior colliculum. Colliculi separated by shallow pit at neck. **Cauda:** Elongate, with elongate colliculum, depressed in centre. **Ostio-caudal differentiation:** Very slight ventral constriction. **Ostium/cauda:** 1:1.2. **Collum:** Absent, but pit at neck. **Crista superior:** Poorly developed at extremes, moderately well developed in centre. **Crista inferior:** Poorly



developed along sulcus but absent at extremes. **Dorsal depression:** Narrow, near margin, area reduced. **Ventral depression:** Absent, groove shallow at margin, distinct posteriorly. **Rostrum:** Sharply rounded and blunt. **Antirostrum:** Minute and rounded. **Excisura:** Narrow, notch shallow, angle wide.

*Coryphaenoides striaturus*, SSF No. 93.12 PLATE 30

**DISTRIBUTION:** Taken only off the Cape in 823-1738 m. Attains >60 cm.

**MATERIAL:** 4/4 (5.8-13.18 mm OD, 230-560 mm TL), PEM 14465 (RUSI 31384), 14466 (RUSI 31417), 14463 (RUSI 31427), 15369; Cape west coast; Id. MJS, PCH, MEA, TI.

**Otolith shape:** Roughly oval. **Thickness:** Moderately thin (c. 8 mm OD) to moderately thick (c. 13 mm OD). **Form:** - Mesial approximately flat, - Lateral slightly convex. **Lateral surface:** In large otoliths (c. 13 mm OD) there is a distinct, broad vertical groove. **Dorsal margin:** Rounded becoming flattened with growth; **sculpture,** slightly lobed. **Ventral margin:** Rounded and entire becoming crenate (c. 13 mm OD). **Posterior margin:** Rounded and irregular. **Sulcus acusticus:** Para-ostial or mesial, homosulcoid. **Colliculum:** Homomorph, two similar colliculi, one may be pointed. **Pseudocolliculum:** Absent, may be nodules present. **Ostium:** Angled at 45°, walls and colliculum poorly defined, groove to margin in small otoliths (<9 mm OD), becoming horizontal and approximately oval. **Cauda:** Approximately horizontal, oval, larger than ostium. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.3, 1:1, 1:0.9, 1:1.7. **Collum:** Absent. **Crista superior:** Poorly developed over ostium, absent over cauda; in large otoliths, poor over ostium with low ridge over cauda. **Crista inferior:** Poorly developed at neck, poor to absent at extremes. **Dorsal depression:** Absent in small otoliths, becomes large over most of reduced area. **Ventral depression:** Absent, groove near margin in large otoliths. **Rostrum:** Rounded and broad. **Antirostrum:** Minute and rounded or sharply rounded. **Excisura:** Narrow, notch very shallow, angle wide or acute.

*Coryphaenoides subserulatus*, SSF No. 93.13  
PLATE 30

**DISTRIBUTION:** Two specimens from Agulhas Bank (980 m), the first record of this species outside New Zealand waters. Attains at least 37 cm.

**MATERIAL:** 1/1 (6.3 mm OD, 352 mm TL, 85 mm PAL), PEM 14510 (RUSI 31423); Cape southwest coast; Id. TI.

**Otolith shape:** Oval. **Thickness:** Moderate. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Rounded; **sculpture,** slightly sinuate. **Ventral margin:** Rounded and entire. **Posterior margin:** Rounded and slightly irregular. **Sulcus acusticus:** Caudal, homosulcoid. **Colliculum:** Homomorph, two similar colliculi. **Pseudocolliculum:** Absent. **Ostium:** Contains rugose anterior colliculum, with ridge at anterior tip. **Cauda:** Cup-like, moderately deep with swirl-patterned colliculum. **Ostio-caudal differentiation:** Dorso-ventrally, mainly ventrally, constricted. **Ostium/cauda:** 1:1.1. **Collum:** Absent. **Crista superior:** Absent under ostium, well developed to ridge-like over cauda. **Crista inferior:** Absent under ostium, poorly developed under cauda. **Dorsal depression:** Almost entire dorsal area flattened and depressed. **Ventral depression:** Absent, broad, shallow groove near margin. **Rostrum:** Absent, **pseudo-rostrum:** Short, broad and rounded. **Antirostrum:** Absent, **pseudo-antirostrum:** Small and rounded. **Excisura:** Absent, **pseudo-excisura:** Moderate, notch shallow and angle wide.

*Gadomus capensis*, SSF No. 93.14 PLATE 31

**DISTRIBUTION:** Table Bay to Mozambique. Attains 46 cm.

**MATERIAL:** 3/7 (6.3-8.6 mm OD, 322-420 mm TL, 88-125 mm PAL), PEM 13765, 13770, 13769; Cape west coast; lodged in SAM.

**Otolith shape:** Approximately oval. **Thickness:** Moderately thick. **Form:** - Mesial flat, - Lateral slightly convex. **Dorsal margin:** Slightly rounded; **sculpture,** slightly lobed. **Ventral margin:** Rounded and entire. **Posterior margin:** Slightly rounded and irregular. **Sulcus acusticus:** Caudal, becoming ostio-caudal in larger otoliths (c. 8 mm OD), homosulcoid. **Colliculum:** Homomorph, two similar, raised colliculi, dumbbell-like. **Pseudocolliculum:** Present, well developed almost joining both colliculi. **Ostium:** Approximately circular to oval, walls poorly defined, colliculum low and depressed in centre. **Cauda:** More elongate with oval colliculum low and depressed in centre. **Ostio-caudal differentiation:** Slight ventral constriction. **Ostium/cauda:** 1:2.4, 1:1.6, 1:2. **Collum:** Absent. **Crista superior:** Absent in juveniles (c. 6 mm OD), well developed in large otoliths, especially over cauda. **Crista inferior:** Absent under ostium, elsewhere poorly developed in small otoliths, well developed in larger individuals. **Dorsal depression:** Absent, area flat. **Ventral depression:** Absent, broad groove joins ostium in large otoliths. **Rostrum:** Absent in small, present in large otoliths: blunt and short, **pseudo-rostrum:** Blunt and broad. **Antirostrum:** Absent but present in large otoliths: short and rounded, **pseudo-antirostrum:** Very blunt or absent. **Excisura:** If present, narrow and notch shallow, angle wide, **pseudo-excisura:** Moderate, notch absent.

*Kuronezumia leonis* (previously *Nezumia*),  
SSF No. 93.21 PLATE 31

**DISTRIBUTION:** Rare off Cape Point; Namibia; also known from southwestern Atlantic. Attains c. 39 cm.

**MATERIAL:** 2/3 (7.9, 9.1 mm OD, 14898 = 354 mm TL, 331, 389 mm SL), PEM 14898 (RUSI 35608), 14899 (RUSI 35608); off Cape Recife, Cape south coast; Id. TI, MEA, MJS.

**Otolith shape:** Approximately oval to oblong. **Thickness:** Moderately thick. **Form:** - Mesial approximately flat, - Lateral slightly convex. **Dorsal margin:** Slightly rounded; **sculpture,** slightly lobed. **Ventral margin:** Rounded or slightly rounded and crenate or slightly irregular. **Posterior margin:** Sharply rounded or rounded and lobed or entire. **Sulcus acusticus:** Ostial, homosulcoid. **Colliculum:** Homomorph, two similar shaped colliculi, with raised margins. **Pseudocolliculum:** Present between colliculi. **Ostium:** Approximately oval, shallow with oval colliculum. **Cauda:** Shallow and elongate, slightly dorsally angled with slightly elongate colliculum. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:1.4, 1:1.3. **Collum:** Absent. **Crista superior:** Low ridge over neck, well developed elsewhere. **Crista inferior:** Poorly developed along entire sulcus. **Dorsal depression:** Shallow and large, covers most of dorsal area. **Ventral depression:** Absent, shallow groove near ventral margin. **Rostrum:** Moderate, broad and rounded. **Antirostrum:** Absent or minute and rounded. **Excisura:** Moderate, notch absent.

*Lucigadus ori* (previously *Ventrifossa*), SSF No. 93.32  
PLATE 31

**DISTRIBUTION:** Off Agulhas Bank, Durban and East London. Also probably from Somalia, Uruguay and southern Brazil. Attains at least 20 cm.

**MATERIAL:** 5/36 (5.1-6.6 mm OD, 174-217 mm TL, 28-34 mm PAL), PEM 14132, 14129 (RUSI 28300), 8122 (RUSI 40679), 14121 (RUSI 28301), 14120; Cape west coast; Id. MJS, PCH, MEA, TI.

**Otolith shape:** Approximately rhomboidal and rounded. **Thickness:** Moderately thick. **Form:** - Mesial approximately flat, - Lateral convex. **Dorsal margin:** Flat; **sculpture,** slightly lobed.



**Ventral margin:** Rounded and crenate or lobed. **Posterior margin:** Sharply rounded, flattened ventral section, irregular. **Sulcus acusticus:** Mesial, may appear ostio-caudal, homosulcoid. **Colliculum:** Homomorph, two similar colliculi. **Pseudocolliculum:** Absent. **Ostium:** Oblong, poorly defined walls, filled by uneven colliculum not distinctly depressed. **Cauda:** Oblong, colliculum with pointed posterior edge. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:1.6, 1:1.4, 1:1.3, 1:1.2, 1:1.1. **Collum:** Absent. **Crista superior:** Absent at extremes, well developed to low ridge in mid-section. **Crista inferior:** Poorly developed, but more raised near centre. **Dorsal depression:** Shallow and broad over most of area. **Ventral depression:** Absent, ventral groove may be present near margin. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

#### *Caelorinchus matamua*, SSF No. 93.16 PLATE 31

**DISTRIBUTION:** Apparently abundant off South Africa, also found off New Zealand and southern Australia. Attains c. 65 cm.

**MATERIAL:** 4/32 (10.3-14.4 mm OD, 362-550 mm TL), PEM 12349, 13817 (RUSI 28299), 13816 (RUSI 28298), 12345; Cape west coast; Id. MJS, PCH, MEA, TI.

**Otolith shape:** Approximately oval. **Thickness:** Moderately thick. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Raised and rounded; **sculpture**, lobed and indented. **Ventral margin:** Rounded, crenate or irregular. **Posterior margin:** Slightly rounded and irregular. **Sulcus acusticus:** Caudal (small) or ostio-caudal with growth (c. 11 mm OD), homosulcoid. **Colliculum:** Homomorph, two similar colliculi. **Pseudocolliculum:** Absent. **Ostium:** Poorly developed walls, anterior colliculum approximately circular and depressed in centre. **Cauda:** More elongate, poorly developed walls, colliculum approximately flat. **Ostio-caudal differentiation:** Very slight ventral constriction. **Ostium/cauda:** 1:1.9, 1:1.9, 1:1.5, 1:1.3. **Collum:** Absent. **Crista superior:** Poorly developed, may be well developed in middle of otolith. **Crista inferior:** Well developed in mid-section, absent at extremes. **Dorsal depression:** Absent, dorsal area slopes to margin. **Ventral depression:** May be a shallow ventral depression. **Rostrum:** Rounded if present, **pseudo-rostrum:** Rounded. **Antirostrum:** Absent, **pseudo-antirostrum:** Absent. **Excisura:** Usually absent, narrow if present.

#### *Malacocephalus laevis*, SSF No. 93.17 PLATE 31

**DISTRIBUTION:** Widespread in Atlantic and Indian Oceans and possibly in Pacific. Attains 60 cm.

**MATERIAL:** 6/70 (7.7-16.3 mm OD, 171-650 mm TL), PEM 12714 (RUSI 28509), 12716 (RUSI 28307), 12628 (RUSI 28308), 14133, 14134, 14135, [14966, 14967 (both RUSI 35576)]; Cape south and west coasts; Id. MJS, PCH, MEA, TI.

**Otolith shape:** Approximately oval, becoming more oblong with growth (c. 11 mm OD). **Thickness:** Moderately thick. **Form:** - Mesial very slightly convex, - Lateral convex. **Dorsal margin:** Flat; **sculpture**, lobed. **Ventral margin:** Rounded and crenate. **Posterior margin:** Blunt and lobed. **Sulcus acusticus:** Ostio-caudal, homosulcoid. **Colliculum:** Homomorph, two similar colliculi. **Pseudocolliculum:** Absent, but slight papilla may be present. **Ostium:** Continuous with **cauda**, distinct anterior and posterior colliculi usually distant from margins, they are irregular and indented. **Ostio-caudal differentiation:** Slight ventral constriction. **Ostium/cauda:** 1:1, 1:1.2, 1:1.1, 1:1.4, 1:1.1, 1:1.1. **Collum:** Absent. **Crista superior:** Poorly developed to well developed in midsection. **Crista inferior:** Poorly developed to absent at extremes. **Dorsal depression:** Absent, area flat. **Ventral depression:** Absent, groove may occur near antero-ventral margin. **Rostrum:** Large and slightly pointed. **Antirostrum:** Generally absent; if present, short and rounded. **Excisura:** Moderate, notch very shallow, angle wide.

#### *Mesobius antipodum*, SSF No. 93.18 PLATE 31

**DISTRIBUTION:** Off south coast; New Zealand, eastern Indian Ocean and Madagascar plateau, also southern Australia. Attains 66 cm.

**MATERIAL:** 1/1 (10.5 mm OD, 460 mm TL), PEM 13318; Cape west coast; lodged in SAM.

**Otolith shape:** Baseball mit-like. **Thickness:** Moderately thick. **Form:** - Mesial approximately flat, - Lateral slightly convex. **Dorsal margin:** Rounded with single oblong lobe; **sculpture**, slightly irregular. **Ventral margin:** Rounded, crenate to cocks-combed. **Posterior margin:** Flattened and entire. **Sulcus acusticus:** Mesial, homosulcoid. **Colliculum:** Homomorph, two similar colliculi. **Pseudocolliculum:** Absent. **Ostium:** Poorly defined bowl with oval, centrally depressed colliculum. **Cauda:** Poorly defined bowl with more angular, irregular and flat colliculum. **Ostio-caudal differentiation:** Slight dorsal constriction. **Ostium/cauda:** 1:1.5. **Collum:** Absent. **Crista superior:** Well developed to a rounded ridge along sulcus. **Crista inferior:** Absent. **Dorsal depression:** Elongate fold above crista, area undulate. **Ventral depression:** Absent, ventral area grooved to margin. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

#### *Nezumia brevisbarbata*, SSF No. 93.19 PLATE 31

**DISTRIBUTION:** Known only off the Cape. Attains c. 26 cm.

**MATERIAL:** 2/4 (5.3, 7.1 mm OD, 183, 260 mm TL, 37, 69mm PAL), PEM 14517 (RUSI 31444), 14464 (RUSI 31455), [15353 (RUSI 38215)]; Cape west coast; Id. MEA, TI.

**Otolith shape:** Approximately oval. **Thickness:** Moderately thick. **Form:** - Mesial slightly convex, - Lateral convex. **Dorsal margin:** Rounded; **sculpture**, irregular becoming lobed in large otoliths (c. 7 mm OD). **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Sharply rounded, may be lobed or irregular. **Sulcus acusticus:** Ostial in small, becoming ostio-caudal in larger otoliths, homosulcoid. **Colliculum:** Homomorph, two similar colliculi. **Pseudocolliculum:** Absent. **Ostium:** Has raised oval colliculum. **Cauda:** Has raised oval colliculum. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:1.6, 1:2.7. **Collum:** Absent. **Crista superior:** Poorly developed in juveniles, ridge-like along entire sulcus in larger otoliths. **Crista inferior:** Poorly to well developed along entire sulcus. **Dorsal depression:** Absent in small, dorsal area depressed to margin in large otoliths. **Ventral depression:** Absent, groove near margin. **Rostrum:** Large, broad and rounded. **Antirostrum:** Small and rounded. **Excisura:** Moderate, notch shallow, angle wide.

#### *Nezumia micronychodon*, SSF No. 93.22 PLATE 31

**DISTRIBUTION:** Mauritania to Namibia. Attains c. 35 cm.

**MATERIAL:** 4/37 (8.0-8.7 mm OD, c. 74-293 mm TL, 58-65 mm PAL), PEM 14467 (RUSI 31453), 14516 (RUSI 31452), 14515 (RUSI 31419), 14514 (RUSI 31437); Namibia; Id. MJS, MEA, TI.

**Otolith shape:** Approximately oval. **Thickness:** Moderately thick. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Slightly rounded; **sculpture**, slightly lobed. **Ventral margin:** Rounded and entire to slightly lobed. **Posterior margin:** Rounded and lobed. **Sulcus acusticus:** Ostial or ostio-caudal (appears ostio-caudal if not coated), homosulcoid. **Colliculum:** Homomorph, two similar colliculi. **Pseudocolliculum:** Variable, a ridge or series of nodules. **Ostium:** Walls poorly defined, with an oval, rugose, indented colliculum. **Cauda:** More elongate, may be closed, has poorly defined walls; oval, rugose and indented colliculum, pointed anteriorly. **Ostio-caudal differentiation:** Very slight ventral constriction. **Ostium/cauda:** 1:2.1, 1:2.2, 1:1.6, 1:1.9. **Collum:** Absent. **Crista superior:** Well developed in centre, poorly developed at extremes. **Crista inferior:** Poorly



developed under colliculi, absent elsewhere. **Dorsal depression:** Absent, area flattened and lower than crista. **Ventral depression:** Absent, poorly developed ventral groove near margin. **Rostrum:** Broad and rounded. **Antirostrum:** Minute or absent. **Excisura:** Moderate, notch shallow, angle wide.

*Nezumia umbracincta* Iwamoto & Anderson, 1994  
SSF No. 93.- PLATE 32

**DISTRIBUTION:** Atlantic coast of South Africa and Agulhas Bank. Attains at least 310 mm TL.

**MATERIAL:** 3/3 (6.8-7.9 mm OD, 290-310 mm TL), PEM 13803, 13805, 13802; west coast of southern Africa; Id. TI, MEA.

**Otolith shape:** Approximately oval. **Thickness:** Moderate. **Form:** - Mesial approximately flat, - Lateral slightly convex. **Dorsal margin:** Raised, may be slightly emarginate; **sculpture,** lobed or entire. **Ventral margin:** Rounded or slightly rounded, approximately entire. **Posterior margin:** Sharply rounded, tapered, may be slightly notched or lobed. **Sulcus acusticus:** Ostial or ostio-caudal, approximately homosulcoid. **Colliculum:** Approximately homomorph, colliculi indented irregularly. **Pseudocolliculum:** Absent. **Ostium:** Elongate with circular, slightly depressed colliculum in posterior part. **Cauda:** Elongate, colliculum oblong, slightly depressed with raised margins, lies in anterior cauda. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.4, 1:1.3, 1:1.2. **Collum:** Absent. **Crista superior:** Well developed along entire sulcus. **Crista inferior:** Poorly developed under ostium, well developed under cauda, poor at tip. **Dorsal depression:** shallow and broad, covering most of the area. **Ventral depression:** Absent, very shallow groove near margin. **Rostrum:** Short, broad and rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Moderate, notch shallow, angle acute or wide.

*Sphagemacrus pumiliceps*, SSF No. 93.27 PLATE 32

**DISTRIBUTION:** Mozambique, Laccadive Sea, Philippines, and East Indies. Attains c. 23 cm.

**MATERIAL:** 2/2 (7.7, 9.76 mm OD, both c. 160 mm TL), PEM 0417, 0182H; off Durban, Natal; Id. PFB, GJBR. **NOTE:** Specimens tentatively identified to this species in 1974. Despite previous taxonomic confusion, we include it as the otoliths are different from other members of this family, including *Lucigadus ori*, with which this species was believed to be confused. Specimens not saved and their identity awaits confirmation with additional material.

**Otolith shape:** Approximately oval to pointed. **Thickness:** Moderately thick. **Form:** - Mesial slightly convex, - Lateral convex. **Lateral surface:** Distinctly grooved and raised. **Dorsal margin:** Flattened; **sculpture,** crenate or slightly irregular. **Ventral margin:** Rounded, may be oblique anteriorly and posteriorly and slightly crenate. **Posterior margin:** Sharply rounded and crenate. **Sulcus acusticus:** Ostial, may appear ostio-caudal, homosulcoid. **Colliculum:** Homomorph, approximately horizontal and depressed in centres. **Pseudocolliculum:** Small and low. **Ostium:** Walls poorly defined anteriorly with elongate colliculum. **Cauda:** Elongate, walls poorly defined posteriorly, flexed up posteriorly. **Ostio-caudal differentiation:** Absent. **Ostium/cauda:** 1:1.2, 1:1.1. **Collum:** Absent. **Crista superior:** Poorly developed at extremes, well developed in centre. **Crista inferior:** Relatively poorly developed. **Dorsal depression:** Elongate and shallow. **Ventral depression:** Absent, groove along margin. **Rostrum:** Short and pointed. **Antirostrum:** Absent or minute and rounded. **Excisura:** Moderate, notch very shallow, angle wide.

*Trachonurus villosus*, SSF No. 93.28 PLATE 32

**DISTRIBUTION:** Mozambique and Indian Ocean and off South Australia; Atlantic and Pacific Oceans. Attains 60 cm.

**MATERIAL:** 1/1 (4.7 mm OD, 256 mm TL), PEM 13413; Cape west coast; lodged in SAM.

**Otolith shape:** Irregular oval. **Thickness:** Moderately thick. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Rounded; **sculpture,** lobed. **Ventral margin:** Rounded and entire. **Posterior margin:** Sharply rounded and entire. **Sulcus acusticus:** Mesial, homosulcoid. **Colliculum:** Homomorph, two low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Rounded, walls extremely poorly developed, oval colliculum slightly raised, depressed in centre. **Cauda:** Elongate, very shallow, colliculum low and slightly depressed in centre. **Ostio-caudal differentiation:** Slight ventral constriction. **Ostium/cauda:** 1:2.1. **Collum:** Absent. **Crista superior:** Very poorly developed. **Crista inferior:** Very poorly developed. **Dorsal depression:** Absent, area flat. **Ventral depression:** Absent. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

*Trachyrincus scabrus*, SSF No. 93.29 PLATE 32

**DISTRIBUTION:** Namibia, west coast of South Africa; eastern North Atlantic and Mediterranean Sea. Attains at least 60 cm.

**MATERIAL:** 4/5 (14.0-14.9 mm OD, 337-432 mm TL), PEM 14764, 14761, 14762, 14763; Cape west coast; lodged in SAM.

**Otolith shape:** Oval with cockscomb. **Thickness:** Moderately thick. **Form:** - Mesial approximately flat, - Lateral convex. **Dorsal margin:** Rounded with cockscomb; **sculpture,** lobed to finger-like projections. **Ventral margin:** Rounded and slightly irregular to entire. **Posterior margin:** Sharply rounded and irregular. **Sulcus acusticus:** Para-ostial, archaesusulcoid. **Colliculum:** Homomorph, one single colliculum. **Pseudocolliculum:** Absent. **Ostium and cauda:** Not differentiated, deep gulley-like sulcus, low colliculum is single with deep central depression, some with a neck. **Ostio-caudal differentiation:** No constrictions. **Collum:** Absent. **Crista superior:** Well developed. **Crista inferior:** Moderately well developed. **Dorsal depression:** Oval, covering most of dorsal area. **Ventral depression:** Absent, area smooth, but shallow ventral groove near postero-ventral margin. **Rostrum:** Broad and rounded. **Antirostrum:** Cockscomb directly above excisura. **Excisura:** Narrow, moderate in small otoliths, notch shallow, angle acute.

*Ventrifossa nasuta*, SSF No. 93.31 PLATE 32

**DISTRIBUTION:** Durban to Mozambique. Attains 30 cm.

**MATERIAL:** 2/2 (4.5, 7.7 mm OD, 138, 171 mm TL, 14749 = 25 mm PAL), PEM 14749, 12714 (RUSI 28509); Cape south and west coasts; Id. TI, MEA, MJS.

**Otolith shape:** Rhomboidal to tapered oval. **Thickness:** Moderately thick. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Flat or slightly rounded; **sculpture,** irregular to lobed. **Ventral margin:** Rounded and slightly crenate. **Posterior margin:** Sharply rounded, slightly irregular or crenate. **Sulcus acusticus:** Mesial, may appear ostial or ostio-caudal, homosulcoid. **Colliculum:** Homomorph, with two low, indented colliculi. **Pseudocolliculum:** Present and nodular, may be indistinct. **Ostium:** Shallow, containing oblong colliculum with depressed centre. **Cauda:** Elongate, colliculum margins raised, centre slightly indented. **Ostio-caudal differentiation:** Very slight ventral constriction. **Ostium/cauda:** 1:1.5, 1:1.2. **Collum:** Absent. **Crista superior:** Very poorly developed (c. 5 mm OD) becoming well developed along entire sulcus (c. 7.7 mm OD). **Crista inferior:** Poorly developed. **Dorsal depression:** Shallow, most of area depressed. **Ventral depression:** Absent, ventral groove shallow and wide near margin. **Rostrum:** Absent or broad, tapered



and sharply rounded. **Antirostrum:** Absent. **Excisura:** Absent or narrow, notch very shallow.

**ORDER OPHIDIIFORMES**  
**OPHIDIIDAE Nelson No. 177**

**Family characteristics:** Variations in the otoliths of this family suggest that more than one lineage is represented here. Otoliths large (to c. 19 mm OD), oval, oblong or spindle-shaped. Sulcus heterosulcoid or archaesulcoid, colliculum homomorph or heteromorph.

**Key**

- 1a. Otoliths spindle shaped; sulcus close to dorsal margin and flexed along its length; openings ostio-caudal . . . . . *Brotula multibarbata* 96.3
- 1b. Otoliths oval, obovate or oblong; sulcus more centrally placed, straight or slightly flexed; opening ostial, para-ostial or mesial . . . . . 2
- 2a. Otolith oval or obovate; sulcus heterosulcoid; sulcus opening ostial . . . . . 3
- 2b. Otolith oval or oblong; sulcus archaesulcoid; sulcus opening para-ostial or mesial . . . . . 5
- 3a. Otolith obovate; single, homomorph anterior colliculum raised; caudal tip not closed . . . . . *Dicrolene intronigra* 96.5
- 3b. Otolith approximately oblong; two heteromorph colliculi; caudal tip closed . . . . . 4
- 4a. Otolith margins slightly crenate; posterior colliculum only slightly flared ventrally, not completely filling cauda; otolith moderately thick . . . . . *Hoplobrotula gnathopus* 96.13
- 4b. Otolith margins crenate; posterior colliculum broader and flared ventrally, filling cauda; otolith moderately thin . . . . . *Genypterus capensis* 96.9
- 5a. Colliculum slightly rugose, may be divided; sulcus ends close to anterior and posterior margins; crista superior poorly developed . . . . . *Neobythites analis* 96.18
- 5b. Colliculum smooth, not divided; sulcus ends well short of anterior and posterior margins; crista superior a low, rounded ridge . . . *Selachophidium guentheri* 96.22

***Brotula multibarbata*, SSF No. 96.3 PLATE 32**

**DISTRIBUTION:** Widely distributed from Red Sea to Port Alfred and east to the central Pacific. Attains c. 100 cm.

**MATERIAL:** 4/4 (6.14-14.12 mm OD, 130-400 mm TL), PEM 15591, 1402H, PEM 14247 (RUSI 34566), 0774H; Comoro Ids, Sodwana Bay and Durban; Id. PCH, OG.

**Otolith shape:** Spindle-shaped. **Thickness:** Moderately thick. **Form:** - Mesial very convex, - Lateral flat. **Lateral surface:** Has ridges and depression. **Dorsal margin:** Rounded; **sculpture**, entire. **Ventral margin:** Rounded and irregular. **Posterior margin:** Pointed and entire. **Sulcus acusticus:** Ostio-caudal, heterosulcoid. **Colliculum:** Heteromorph and low. **Pseudocolliculum:** Absent. **Ostium:** Approximately oval, filled with low, reticulate patterned colliculum. Sulcus lies close to dorsal margin. **Cauda:** Elongate, flexed, pointed at both ends and narrower than ostium. Low, reticulate-patterned colliculum fills the cauda. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:1.6, 1:2.2, 1:2.4, 1:1.8. **Collum:** Absent. **Crista superior:** Poorly developed along entire sulcus. **Crista inferior:** Poorly developed along entire sulcus. **Dorsal depression:** Absent. **Ventral depression:** Absent. **Rostrum:** Small and pointed. **Antirostrum:** Absent. **Excisura:** Moderate, notch absent.

***Dicrolene intronigra*, SSF No. 96.5 PLATE 32**

**DISTRIBUTION:** Known from Namibia. Also northwest Africa and from the western North Atlantic. Attains c. 30 cm.

**MATERIAL:** 7/57 (3.1-7.3 mm OD, 161-295 mm TL), PEM 13660, 13658, 13655, 13654, 14461 (RUSI 31415), 14680, 13656; Cape west coast; Id. MJS, PCH.

**Otolith shape:** Oval becoming obovate. **Thickness:** Moderately thin. **Form:** - Mesial flat to slightly convex, - Lateral flat. **Dorsal margin:** Rounded; **sculpture**, entire. **Ventral margin:** Slightly rounded, becoming straight, entire to indented sculpture. **Posterior margin:** Sharply rounded and entire. **Sulcus acusticus:** Ostial (the caudal tip has no distinct closing wall), heterosulcoid. **Colliculum:** Homomorph, only one, poorly defined, anterior colliculum visible. **Pseudocolliculum:** Absent. **Ostium:** Horizontal and elongate, with small, elongate colliculum. **Cauda:** Flexes ventrally, with poorly defined walls, especially at tip. **Ostio-caudal differentiation:** Slight dorso-ventral constrictions. **Ostium/cauda:** 1:0.6, 1:0.7, 1:0.7, 1:0.8, 1:0.9, 1:0.8, 1:0.7. **Collum:** Absent. **Crista superior:** Poorly developed to absent in caudal region, absent at tip. **Crista inferior:** Low ridge in mid-area, absent at extremes. **Dorsal depression:** Absent, groove at dorsal margin. **Ventral depression:** Low depression in centre. **Rostrum:** Absent or minute and rounded. **Antirostrum:** Large and rounded. **Excisura:** Moderate, notch very shallow, angle wide.

***Genypterus capensis*, SSF No. 96.9 PLATE 33**

**DISTRIBUTION:** Known only from Walvis Bay to Algoa Bay. Attains 160 cm or more.

**MATERIAL:** 7/67 (6.3-18.2 mm OD, 205-1080 mm TL), PEM 12036, 11244, 12607, 9013 (RUSI 37519), 11349, 15157, 13425, [9011-9015 (RUSI 37519)]; Cape west and south coasts; Id. MJS, PCH.

**Otolith shape:** Oblong. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Slightly rounded; **sculpture**, crenate to lobed. **Ventral margin:** Rounded, smooth centrally, lobed or crenate at ends. **Posterior margin:** Sharply rounded, crenate or irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, two colliculi which are occasionally fused. **Pseudocolliculum:** Absent. **Ostium:** Elongate, horizontal, larger than cauda with low colliculum. **Cauda:** Small and oval, slightly flexed ventrally, filled with low colliculum. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:0.5, 1:0.4, 1:0.4, 1:0.4, 1:0.5, 1:0.4, 1:0.5. **Collum:** Absent. **Crista superior:** Poorly developed or very low ridge. **Crista inferior:** Poorly developed. **Dorsal depression:** Very shallow depression. **Ventral depression:** Absent, shallow groove near margin. **Rostrum:** Short and sharply rounded. **Antirostrum:** Small and rounded. **Excisura:** Moderate, shallow notch, angle varies.

***Hoplobrotula gnathopus*, SSF No. 96.13 PLATE 33**

**DISTRIBUTION:** Known only from Natal and a few more northern localities. Attains c. 45 cm.

**MATERIAL:** 2/2 (11.5, 19.9 mm OD, 246, 521 mm TL), PEM 15009 (RUSI 35571), 14976 (RUSI 35543); eastern Cape (34°12.8'S, 26°39.4'E) and Transkei; Id. MJS, MEA.

**Otolith shape:** Oblong. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Straight, sloping posteriorly; **sculpture**, slightly irregular to crenate. **Ventral margin:** Rounded, entire to crenate in larger otoliths. **Posterior margin:** Pointed and lobed. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low. **Pseudocolliculum:** Absent. **Ostium:** Elongate, approximately horizontal, filled by large, smooth colliculum. **Cauda:** Small and oval with smooth

colliculum. **Ostio-caudal differentiation:** Ventral constriction. **Ostium/cauda:** 1:0.3, 1:0.4. **Collum:** Absent. **Crista superior:** Well developed to ridge-like in neck, absent at caudal tip. **Crista inferior:** Poorly developed along entire sulcus. **Dorsal depression:** Shallow above crista. **Ventral depression:** Absent. **Rostrum:** Moderate and rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Moderate, notch shallow, angle acute.

*Neobythites analis*, SSF No. 96.18 PLATE 33

**DISTRIBUTION:** This species is either identical to *N. macrops* or is endemic to South Africa. From Algoa Bay to Natal coast. Attains 17 cm.

**MATERIAL:** 3/3 (7.6-10.58 mm OD, 140-188 mm SL), PEM 13032 (RUSI 28319), 15154, 1571H; Natal and Mozambique; Id. PCH.

**Otolith shape:** Oval. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral flat. **Dorsal margin:** Slightly rounded to flattened; **sculpture**, slightly irregular. **Ventral margin:** Rounded, crenate, becoming entire with growth. **Posterior margin:** Sharply rounded and entire. **Sulcus acusticus:** Para-ostial, archaesusloid. **Colliculum:** Homomorph, colliculum entire or indistinctly divided. **Pseudocolliculum:** Absent. **Ostium and cauda:** Undifferentiated, sulcus almost horizontal. **Ostio-caudal differentiation:** No constrictions. **Collum:** Absent. **Crista superior:** Poorly developed. **Crista inferior:** Poorly developed. **Dorsal depression:** Oval and shallow over most of dorsal area. **Ventral depression:** Absent. **Rostrum:** Blunt, short and rounded. **Antirostrum:** Absent. **Excisura:** Very narrow, notch absent.

*Selachophidium guentheri*, SSF No. 96.22 PLATE 33

**DISTRIBUTION:** Common from Angola to Mozambique. Attains c. 30 cm.

**MATERIAL:** 6/44 (4.6-10.4 mm OD, 156-284 mm TL), PEM 12062, 14745, 14013, 14014, 14902 (RUSI 35574), 14059; Cape east and west coasts; Id. MJS, MEA.

**Otolith shape:** Oval. **Thickness:** Moderately thick. **Form:** - Mesial flat to slightly convex, - Lateral convex. **Dorsal margin:** Raised; **sculpture**, lobed or emarginate. **Ventral margin:** Rounded and entire. **Posterior margin:** Sharply rounded, entire or slightly lobed. **Sulcus acusticus:** Para-ostial, may appear mesial especially in small otoliths, archaesusloid. **Colliculum:** Homomorph, single undivided colliculum. **Pseudocolliculum:** Absent. **Ostium and cauda:** Undifferentiated, sulcus horizontal. **Ostio-caudal differentiation:** Not constricted. **Collum:** Absent. **Crista superior:** Poorly developed. **Crista inferior:** Poorly developed. **Dorsal depression:** Oval and shallow over most of dorsal area. **Ventral depression:** Absent, groove may be present near margin. **Rostrum:** Short, broad and rounded. **Antirostrum:** Absent. **Excisura:** Very narrow, notch absent.

CARAPIDAE Nelson No. 178

**Family characteristics:** Based on the single species available. Otoliths large, up to about 6.2 mm OD. Oblong, tapered posteriorly, homosulcoid with para-ostial opening. Homomorph with single, slightly raised colliculum filling the sulcus.

*Encheliophis boraborensis*, Kaup, 1856  
SSF No. 97.- PLATE 33

**DISTRIBUTION:** Occurs in holothurians; widely distributed in, but not yet recorded from, southern Africa apart from this specimen.

**MATERIAL:** 1/1 (6.2 mm OD, 258 mm TL), PEM 15473 (RUSI 40594); Tongaland, northern Natal; Id. PCH.

**Otolith shape:** Oblong with tapered posterior tip. **Thickness:** Moderately thick. **Form:** - Mesial slightly convex, - Lateral convex. **Dorsal margin:** Rounded; **sculpture**, slightly irregular.

**Ventral margin:** Slightly rounded and entire. **Posterior margin:** Oblique, tapered and pointed. **Sulcus acusticus:** Para-ostial, homosulcoid. **Colliculum:** Homomorph, single slightly raised colliculum. **Pseudocolliculum:** Absent. **Ostium and cauda:** Undifferentiated, sulcus oblong filled by colliculum with indented margins inside cristae. **Ostio-caudal differentiation:** Absent. **Collum:** Absent. **Crista superior:** Well developed along entire sulcus. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Crescentic covering most of narrow dorsal area. **Ventral depression:** Absent. **Rostrum:** Short and sharply rounded. **Antirostrum:** Absent. **Excisura:** Very narrow, notch very shallow, angle wide.

BYTHITIDAE Nelson No. 179

**Family characteristics:** Otoliths relatively thick and large, up to 15 mm OD. Sulcus archaesusloid or heterosulcoid with mesial opening. Cristae poorly developed or absent. Colliculi heteromorph or single homomorph.

Key

- 1a. Otolith small and oval, tapered at anterior and posterior tips; sulcus heterosulcoid; colliculi heteromorph and low . . . . . *Bidenichthys capensis* 98.1
- 1b. Otolith large and rectangular or approximately oval; sulcus archaesusloid; colliculum homomorph, raised, indented in centre . . . . . 2
- 2a. Otolith approximately oval; colliculum raised, deeply indented in centre; lateral surface with no distinguishing features . . . . . *Cataetx laticeps* 98.3
- 2b. Otolith rectangular; colliculum elongate, slightly indented; lateral surface with broad flat ridge. . . . . *Cataetx niki* 94.4

*Bidenichthys capensis*, SSF No. 98.1 PLATE 34

**DISTRIBUTION:** Endemic from East London to the Cape. Possibly two species, one unnamed in this area. Attains 9 cm.

**MATERIAL:** 6/14 (1.7-3.4 mm OD, 30-62 mm TL), PEM 5217, 5600, 5215, 5352, 5013 (RUSI 13420), 5577; Algoa Bay to Tsitsikamma coast; Id. MJS, PCH.

**Otolith shape:** Oblong. **Thickness:** Moderately thick. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Flattened; **sculpture**, entire. **Ventral margin:** Slightly rounded and entire. **Posterior margin:** Sharply rounded and entire. **Sulcus acusticus:** Mesial, heterosulcoid. **Colliculum:** Heteromorph, unequal-sized colliculi. **Pseudocolliculum:** Absent. **Ostium:** Large, elongate with low colliculum, poorly defined walls. **Cauda:** Small, with round, slightly raised colliculum. **Ostio-caudal differentiation:** Slight ventral constriction. **Ostium/cauda:** 1:0.4, 1:0.4, 1:0.4, 1:0.4, 1:0.5, 1:0.6. **Collum:** Absent. **Crista superior:** Poorly developed, more developed over neck. **Crista inferior:** Poorly developed, more developed under the neck. **Dorsal depression:** Absent. **Ventral depression:** Wide, shallow groove close to margin. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

*Cataetx laticeps*, SSF No. 98.3 PLATE 34

**DISTRIBUTION:** Apparently widely distributed in Atlantic Ocean in 1000-2000 m. Attains at least 54 cm.

**MATERIAL:** 1/1 (10.8 mm OD, 540 mm TL), PEM 13316; Cape west coast; lodged in SAM.

**Otolith shape:** Oval. **Thickness:** Thick. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Flat; **sculpture**, entire. **Ventral margin:** Flat and entire. **Posterior margin:** Straight and entire. **Sulcus acusticus:** Mesial, archaesusloid. **Colliculum:** Homomorph, single large, oval colliculum raised at edges and deeply indented. **Pseudocolliculum:** Absent. **Ostium and cauda:** Undifferentiated. **Ostio-caudal differentiation:** No constrictions. Col-



lum: Absent. **Crista superior:** Absent. **Crista inferior:** Absent. **Dorsal depression:** Absent, two low horizontal ridges between colliculum and anterior margin. **Ventral depression:** Slight depression to posterior of colliculum. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

*Cataetx niki*, SSF No. 98.4 PLATE 34

**DISTRIBUTION:** Known only from two specimens trawled off the Cape and this specimen from off Namibia. Attains at least 58 cm.

**MATERIAL:** 1/1 (14.7 mm OD, 583 mm TL), PEM 14589; off Luderitz, Namibia; lodged in SAM.

**Otolith shape:** Rectangular. **Thickness:** Thick and brick-like. **Form:** - Mesial flat, - Lateral very convex. **Lateral surface:** Elongate, broad, flat ridge along otolith. **Dorsal margin:** Flat; sculpture, entire. **Ventral margin:** Flat and entire. **Posterior margin:** Approximately straight, angled and entire. **Sulcus acusticus:** Mesial, archaesusloid. **Colliculum:** Homomorph, single colliculum slightly indented and elongate. **Pseudocolliculum:** Absent. **Ostium and cauda:** Undifferentiated. **Ostio-caudal differentiation:** No constrictions. **Collum:** Absent. **Crista superior:** Absent. **Crista inferior:** Absent. **Dorsal depression:** Absent, low horizontal ridge between colliculum and anterior margin. **Ventral depression:** Absent, area slightly undulating. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

ORDER BATRACHOIDIFORMES

BATRACHOIDIDAE Nelson No. 181

**Family characteristics:** Otoliths approximately elliptic, or oval to rounded triangular. Homosulcoid, opening ostial but may appear ostio-caudal or mesial; homomorph with two indistinct colliculi. Pits in ostium and cauda. Up to c. 12 mm OD.

Key

- 1a. Otoliths oval to rounded triangular; dorsal margin of otolith raised; sulcus ostial but may appear ostio-caudal . . . . . *Batrachthys apiatus* 100.3
- 1b. Otoliths oval to elliptic; dorsal margin of otolith rounded or slightly rounded; sulcus ostial but may appear mesial . . . . . 2
- 2a. Otolith oval; crista superior forms a narrow and low ridge over collum; dorsal depression relatively shallow . . . . . *Chatrabus hendersoni* 100.5
- 2b. Otolith oval to elliptic, often pointed posteriorly; crista superior forms a broad ridge over collum; dorsal depression distinct and deep . . . . . *Chatrabus melanurus* 100.6

*Batrachthys apiatus*, SSF No. 100.3 PLATE 34

**DISTRIBUTION:** From Saldanha Bay to the Umtata River, Transkei. Attains 10 cm.

**MATERIAL:** 2/2 (2.6, 2.8 mm OD, 70, 71 mm TL), PEM 14824, 9981; near Algoa Bay; Id. MJS.

**Otolith shape:** Approximately oval to rounded triangular. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral convex. **Dorsal margin:** Raised and rounded; sculpture, irregular. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Sharply rounded to pointed, slightly irregular. **Sulcus acusticus:** Ostial, may appear ostio-caudal, homosulcoid. **Colliculum:** Homomorph, two very low and indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Pit present in posterior part of the ostium, anteriorly it shallows before joining anterior margin. **Ventral wall** very poorly defined under anterior part of ostium. **Cauda:** Tear-drop shaped pit fills cauda. **Ostio-caudal differen-**

**tiation:** Slight dorso-ventral constriction. **Ostium/cauda:** 1:0.8, 1:0.8. **Collum:** Low wall-like structure. **Crista superior:** Well developed to ridge-like over collum, poorly developed over cauda. **Crista inferior:** Well developed under collum, poorly developed elsewhere. **Dorsal depression:** Oval. **Ventral depression:** Absent, very shallow ventral groove close to ventral margin. **Rostrum:** Short, blunt and rounded. **Antirostrum:** Very short, rounded or angled. **Excisura:** Wide, notch very shallow, angle wide.

*Chatrabus hendersoni*, SSF No. 100.5 PLATE 34

**DISTRIBUTION:** Known only from Port Alfred to Storms River mouth. Attains 22 cm.

**MATERIAL:** 1/1 (5 mm OD, 122 mm TL), PEM 11329 (RUSI 28295); Algoa Bay; Id. MJS.

**Otolith shape:** Oval. **Thickness:** Moderately thick. **Dorsal margin:** Rounded; sculpture, irregularly lobed. **Form:** - Mesial convex, - Lateral approximately flat. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Sharply rounded, slightly irregular. **Sulcus acusticus:** Ostial, but may appear mesial in uncoated otoliths, homosulcoid. **Colliculum:** Homomorph, two very low, indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Has a shallow posterior pit, becoming shallow towards anterior margin, poorly defined ventral wall. **Cauda:** Has deeper oval, teardrop-shaped pit. **Ostio-caudal differentiation:** Slight dorso-ventral constriction. **Ostium/cauda:** 1:0.9. **Collum:** Slightly raised, uneven. **Crista superior:** Well developed, uneven ridge over collum, poor at extremes. **Crista inferior:** Well developed under collum, poor at extremes. **Dorsal depression:** Oval and striated. **Ventral depression:** Absent, a smooth raised area occurs below collum. **Rostrum:** Blunt and rounded. **Antirostrum:** Minute and rounded. **Excisura:** Moderate, notch very shallow, angle wide.

*Chatrabus melanurus*, SSF No. 100.6 PLATE 34

**DISTRIBUTION:** Known only from Angola, round the coast to Port St Johns and off Cape Frio, Namibia. Attains 26 cm.

**MATERIAL:** 5/10 (4.95-11.6 mm OD, 128-196 mm TL), PEM 5487, 12545 (RUSI 28296), 14400 (RUSI 34145), 14882 (RUSI 35579), 5595; Cape south coast; Id. MJS, PCH.

**Otolith shape:** Elliptic. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral slightly concave. **Dorsal margin:** Slightly rounded; sculpture, lobed or slightly irregular. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Sharply rounded and slightly irregular. **Sulcus acusticus:** Ostial, but may appear mesial in uncoated otoliths, homosulcoid. **Colliculum:** Homomorph, two colliculi low or depressed. **Pseudocolliculum:** Absent. **Ostium:** Has distinct oval pit posteriorly, shallows towards margin, dorsal and ventral walls well defined. **Cauda:** Distinct pit, similar depth to ostium. **Ostio-caudal differentiation:** Slight dorso-ventral constrictions. **Ostium/cauda:** 1:1.2: 1:1.4, 1:1.5, 1:1.3, 1:1.2. **Collum:** Slightly raised and uneven. **Crista superior:** Well developed, uneven ridge over collum, indistinct over anterior ostium. **Crista inferior:** Well developed, absent under ostium, poorly developed under cauda, absent at tip. **Dorsal depression:** Oval, deep and striated. **Ventral depression:** Absent, may be very shallow groove near ventral margin. **Rostrum:** Short, broad and rounded. **Antirostrum:** Absent. **Excisura:** Poorly defined, moderate width, notch absent.

ORDER LOPHIIFORMES

LOPHIIDAE Nelson No. 182

**Family characteristics:** Otoliths approximately oval to oblong, dorsal margin raised or emarginate and lobed, up to c. 7.9 mm OD.

Homosulcoid or archaesulcoid, mesial and homomorph colliculi or no raised colliculi.

#### Key

- 1a. Sulcus homosulcoid; colliculi homomorph and low  
..... *Lophiodes mutilus* 101.2
- 1b. Sulcus archaesulcoid; no raised colliculi ..... 2
- 2a. Otolith approximately square; dorsal margin raised but slightly emarginate in centre; ventral corners produced and ventral margin flat. . *Lophius vaillanti* 101.-
- 2b. Otolith approximately oval and lobed dorsally; dorsal margin of otolith raised but not emarginate; ventral corners rounded . . . . . *Lophius vomerinus* 101.4

#### *Lophiodes mutilus*, SSF No. 101.2 PLATE 34

**DISTRIBUTION:** Indo-West Pacific south to Natal. Attains 35 cm.

**MATERIAL:** 2/2 (4.15, 7.14 mm OD, 160, 245 mm TL), PEM 0434, 0435; off the Bluff, Durban; Id. GJBR.

**Otolith shape:** Oval to oblong and lobed. **Thickness:** Moderately thin. **Form:** - Mesial flat but irregular, - Lateral slightly concave. **Lateral surface:** Margin smooth, centre rugose. **Dorsal margin:** Raised or emarginate; **sculpture**, lobed. **Ventral margin:** Flattened and slightly irregular. **Posterior margin:** Rounded and lobed. **Sulcus acusticus:** Mesial, homosulcoid. **Colliculum:** Homomorph, two very low, indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium** and **cauda:** Indistinguishable, similar, oval shape, poorly defined in juveniles. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:0.8 (0434 indistinct features). **Collum:** Absent. **Crista superior:** Poorly developed, absent at tips. **Crista inferior:** Low ridge in neck area, absent at tips. **Dorsal depression:** Flat, semi-circular depression over neck. **Ventral depression:** Absent, raised hump under the neck. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

#### *Lophius vaillanti* Regan, 1903, SSF No. 101.- PLATE 34

**DISTRIBUTION:** Atlantic, off Namibia.

**MATERIAL:** 1/1 (7.9 mm OD, TL not recorded), PEM 15063; off Namibia at Station No B16 - P101; Id. RWL.

**Otolith shape:** Approximately square with rounded top. **Thickness:** Moderately thick. **Form:** - Mesial flat but irregular, - Lateral slightly concave. **Lateral surface:** Rugose with smooth margins. **Dorsal margin:** Rounded; **sculpture**, lobed. **Ventral margin:** Flattened and slightly irregular. **Posterior margin:** Straight and slightly lobed. **Sulcus acusticus:** Mesial, archaesulcoid. **Colliculum:** No raised colliculi. **Pseudocolliculum:** Absent. **Ostium** and **cauda:** Undifferentiated, sulcus is an indentation in centre of otolith with no dorsal wall, ventral wall very steep. **Ostio-caudal differentiation:** No constrictions. **Collum:** Absent. **Crista superior:** Absent. **Crista inferior:** Well developed - may be a low ridge towards centre. **Dorsal depression:** Absent, area flat and striated. **Ventral depression:** Absent - but raised hump under sulcus, area uneven. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

#### *Lophius vomerinus* (*L. upsicephalus* in SSF) SSF No. 101.4 PLATE 34

**DISTRIBUTION:** Found off Namibia and South Africa (see Leslie and Grant, 1991 for taxonomy). Attains 100 cm.

**MATERIAL:** 5/104 (2.2-7.1 mm OD, 96-500 mm TL), PEM 14139 (RUSI 28297), 14141, 11715, 11717, 11719; Cape west and south coasts; Id. MJS, PCH.

**Otolith shape:** Approximately oval and lobed. **Thickness:** Moderately thick but thinner at dorsal edge. **Form:** - Mesial flat

but uneven, - Lateral flat but uneven. **Lateral surface:** Smooth margin, centre rugose. **Dorsal margin:** Well rounded; **sculpture**, lobed. **Ventral margin:** Flattened or slightly rounded and slightly irregular. **Posterior margin:** Sharply rounded and irregular. **Sulcus acusticus:** Mesial, archaesulcoid. **Colliculum:** No raised colliculi. **Pseudocolliculum:** Absent. **Ostium** and **cauda:** Not differentiated, sulcus is shallow, slight downward flexion at tips, ventral wall steep and high. **Ostio-caudal differentiation:** No constrictions. **Collum:** Absent. **Crista superior:** Absent. **Crista inferior:** Well developed, may be a low ridge. **Dorsal depression:** Absent, area flat. **Ventral depression:** Absent, raised hump under sulcus. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

#### ANTENNARIIDAE Nelson No. 183

**Family characteristics:** Discoid becoming oval, archaesulcoid, sulcus may be angled and opening mesial or ostio-caudal, up to c. 5 mm OD. Either no raised colliculi or single, indistinct colliculum present. Raised hump under mid-sulcus.

#### Key

- 1a. Otolith discoid; sulcus horizontal, opening ostio-caudal (in large otoliths) ..... *Histrio histrio* 102.9
- 1b. Otolith oval to oblong; sulcus angled, opening mesial or para-ostial ..... 2
- 2a. Otolith oval and broad; dorsal depression indistinct .....  
..... *Antennarius hispidus* 102.4
- 2b. Otolith oval to oblong; dorsal depression distinct .....  
..... *Antennarius striatus* 102.7

#### *Antennarius hispidus*, SSF No. 102.4 PLATE 35

**DISTRIBUTION:** Indo-West Pacific, south to Knysna. Attains 20 cm.

**MATERIAL:** 1/1 (2.8 mm OD, 50 mm TL), PEM 0228; off Tugela mouth; Id. GJBR.

**Otolith shape:** Irregular oval. **Thickness:** Moderately thick. **Form:** - Mesial slightly convex, - Lateral flat. **Dorsal margin:** Slightly rounded; **sculpture**, slightly irregular. **Ventral margin:** Slightly flattened and slightly irregular. **Posterior margin:** Sharply rounded and slightly irregular. **Sulcus acusticus:** Mesial may appear para-ostial, archaesulcoid. **Colliculum:** No raised colliculi. **Pseudocolliculum:** Absent. **Ostium** and **cauda:** Undifferentiated, sulcus oval in shape, a shallow groove angled at 45°. A very shallow groove lies between the sulcus and antero-dorsal corner, this may not be visible in uncoated otoliths. **Ostio-caudal differentiation:** No constrictions. **Collum:** Absent. **Crista superior:** Poorly developed over the sulcus. **Crista inferior:** Poorly developed under the sulcus. **Dorsal depression:** Absent. **Ventral depression:** Absent, raised hump below sulcus. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

#### *Antennarius striatus*, SSF No. 102.7 PLATE 35

**DISTRIBUTION:** South east coast of Africa to Algoa Bay, throughout Indo-West Pacific to Hawaiian islands. Also in western and eastern Atlantic. Attains 22 cm.

**MATERIAL:** 5/6 (4.05-5.0 mm OD, 115-148 mm TL), PEM 0299 (RUSI 4555), 14842, 14840 & 14841 (both RUSI 37089), 14843, [14839 (RUSI 37089)]; ORI and Bushmans River mouth; Id. GJBR, MMS, MJS, PCH.

**Otolith shape:** Oval to oblong. **Thickness:** Moderately thick. **Form:** - Mesial very slightly convex, - Lateral slightly concave. **Dorsal margin:** Flat or slightly rounded; **sculpture**, slightly irregular. **Ventral margin:** Slightly rounded and irregular. **Posterior margin:** Rounded and irregular. **Sulcus acusticus:** Mesial, may appear para-ostial, archaesulcoid. **Colliculum:** No raised colliculi. **Pseudocolliculum:** Absent. **Ostium** and **cauda:** Undif-



ferentiated, an elongate pit, becomes shallower anteriorly, slightly angled. The cristae appear to extend beyond the sulcus towards the margin suggesting a very shallow channel. **Ostio-caudal differentiation:** No constrictions. **Collum:** Absent. **Crista superior:** A short low ridge in centre, absent at extremes. **Crista inferior:** Low and uneven ridge under sulcus, absent at ends, may extend towards anterior margin. **Dorsal depression:** Shallow, semi-circular depression above sulcus. **Ventral depression:** Horse-shoe shaped below the raised hump under sulcus. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

***Histrio histrio*, SSF No. 102.9 PLATE 35**

**DISTRIBUTION:** In tropical to temperate waters of all oceans but apparently absent in the Pacific east of Guam. Attains 19 cm.  
**MATERIAL:** 2/3 (1.1, 2.2 mm OD, 9654 = 200 mm TL, 0792 not recorded), PEM 0792, 9654, [15493 (RUSI 40552)]; Swartkops estuary and Port Alfred; Id. GJBR, MJS.

**Otolith shape:** Discoid. **Thickness:** Moderately thick. **Form:** - Mesial flat, - Lateral slightly convex. **Dorsal margin:** Round; **sculpture**, slightly irregular. **Ventral margin:** Round and slightly irregular. **Posterior margin:** Rounded and may be indented or slightly irregular. **Sulcus acusticus:** Ostio-caudal, mesial in small otoliths, archaesulcoid. **Colliculum:** Homomorph - single, low, irregular colliculum. **Pseudocolliculum:** Absent. **Ostium** and **cauda:** Undifferentiated. Open to both ends in large otoliths (2.2 mm OD), with low colliculum, poorly differentiated walls. **Ostio-caudal differentiation:** Absent. **Collum:** Absent. **Crista superior:** Very poorly developed along entire sulcus. **Crista inferior:** Poorly developed. **Dorsal depression:** Shallow depression to dorsal ridge near margin. **Ventral depression:** Absent. A plateau occurs below sulcus with a semi-circular groove below this (only apparent in large otoliths). **Rostrum:** Small and rounded. **Antirostrum:** Small and rounded. **Excisura:** Narrow, notch shallow, angle wide (previous three features absent when opening is mesial).

**CHAUNACIDAE Nelson No. 185**

**Family characteristics:** Archaesulcoid, mesial, no raised colliculi, up to c. 10 mm OD. Only a single species available. Similar to the previous family.

***Chaunax pictus*, SSF No. 103.2 PLATE 35**

**DISTRIBUTION:** Atlantic and between Knysna and Natal. Attains 40 cm.  
**MATERIAL:** 7/19 (2.0-9.6 mm OD, 49-260 mm TL), PEM 14422 (RUSI 28306), 11301, 12956, 12837, 12972, 12955, 12954 (RUSI 34164), [12704 (RUSI 28510), 12838 (RUSI 28513), 14973 (RUSI 35516)]; Mozambique and Cape south coast; Id. MJS, PCH.  
**Otolith shape:** Oval and lobed. **Thickness:** Moderately thick. **Form:** - Mesial slightly convex, - Lateral convex. **Dorsal margin:** Slightly rounded; **sculpture**, lobed. **Ventral margin:** Slightly rounded and irregular. **Posterior margin:** Rounded and irregular. **Sulcus acusticus:** Mesial but indistinct closure, archaesulcoid. **Colliculum:** No raised colliculi. **Pseudocolliculum:** Absent. **Ostium** and **cauda:** Undifferentiated, although anterior part is shallower than the rest of the pit-like sulcus with steep ventral wall. A fold from the antero-dorsal wall may meet the sulcus. **Ostio-caudal differentiation:** No constrictions. **Collum:** Absent. **Crista superior:** Well developed over the sulcus pit, absent elsewhere. **Crista inferior:** Well developed to low ridge under pit. **Dorsal depression:** Absent. **Ventral depression:** Absent. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

**OGCOEPHALIDAE Nelson No. 186**

**Family characteristics:** Otoliths oval, up to c. 7.8 mm OD; archaesulcoid, sulcus depressed, opening mesial; may be homo-

morph, low colliculum, cristae poorly developed. May be low hump under sulcus.

**Key**

- 1a. Dorsal margin of otolith approximately flat, serrate or lobed; sulcus angled and curved . . . . . *Halieutaea fitzsimonsi* 104.2
- 1b. Dorsal margin of otolith rounded, entire, slightly sinuate or lobed; sulcus with horizontal pit . . . . . 2
- 2a. Dorsal margin of otolith slightly rounded sinuate or lobed; sulcus pit irregular . . . . . *Malthopsis luteus* 104.6
- 2b. Dorsal margin of otolith slightly rounded almost entire to slightly irregular; sulcus pit horizontal, elongate and oval . . . . . *Malthopsis tiarella* 104.8

***Halieutaea fitzsimonsi*, SSF No. 104.2 PLATE 35**

**DISTRIBUTION:** Known from Plettenberg Bay to Tugela River, Natal. Attains 30 cm.  
**MATERIAL:** 5/17 (2.65-7.8 mm OD, 48-180 mm TL), PEM 4641, 12840, 12844, 12849, 12969 (RUSI 28309), [9283, 9284 (both RUSI 37444)]; Mozambique and Cape south coast; Id. MJS, PCH.  
**Otolith shape:** Oval and lobed. **Thickness:** Moderately thick. **Form:** - Mesial slightly convex, - Lateral convex ventrally, concave dorsally. **Dorsal margin:** Approximately flat; **sculpture**, serrate or lobed. **Ventral margin:** Flattened and slightly irregular. **Posterior margin:** Rounded or sharply rounded and entire. **Sulcus acusticus:** Mesial, archaesulcoid. **Colliculum:** No raised colliculi. **Pseudocolliculum:** Absent. **Ostium** and **cauda:** Undifferentiated. Sulcus is shallow, poorly defined and angled. **Ostio-caudal differentiation:** Absent. **Collum:** Absent. **Crista superior:** Poorly developed over anterior of sulcus. **Crista inferior:** Low ridge anteriorly, poorly developed elsewhere. **Dorsal depression:** Absent, area may be grooved from margin lobes. **Ventral depression:** Absent, bulge under sulcus, may be a groove near the margin. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

***Malthopsis luteus*, SSF No. 104.6 PLATE 35**

**DISTRIBUTION:** Eastern Indian Ocean and Japan, recently taken off Kenya. Attains 10 cm.  
**MATERIAL:** 1/1 (3.7 mm OD, 92 mm TL), PEM 12965; Mozambique; Id. MJS, lodged in JLBsII.  
**Otolith shape:** Oval. **Thickness:** Moderately thick. **Form:** - Mesial slightly convex, - Lateral slightly convex with depression near centre. **Dorsal margin:** Slightly rounded; **sculpture**, sinuate or slightly lobed. **Ventral margin:** Rounded and entire. **Posterior margin:** Blunt and entire. **Sulcus acusticus:** Mesial, archaesulcoid. **Colliculum:** Homomorph, low colliculum. **Pseudocolliculum:** Absent. **Ostium** and **cauda:** Undifferentiated (shallow pit may occur anterior to sulcus). **Ostio-caudal differentiation:** No constrictions. **Collum:** Absent. **Crista superior:** Poorly developed. **Crista inferior:** Poorly developed. **Dorsal depression:** Absent, area flat and striated. **Ventral depression:** Absent, bulge under sulcus. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

***Malthopsis tiarella*, SSF No. 104.8 PLATE 35**

**DISTRIBUTION:** Natal and Japan. Attains c. 20 cm.  
**MATERIAL:** 2/2 (2.9, 4.0 mm OD, 65, 196 mm TL), PEM 13068 (RUSI 28477), 13024 (RUSI 28477); Mozambique; Id. MJS, PCH.  
**Otolith shape:** Approximately oval. **Thickness:** Moderately thick. **Form:** - Mesial slightly convex, - Lateral slightly convex. **Dorsal margin:** Slightly rounded; **sculpture**, entire to slightly irregular. **Ventral margin:** Rounded and entire. **Posterior margin:** Rounded and entire. **Sulcus acusticus:** Mesial, archaesulcoid. **Colliculum:** Homomorph, may be low colliculum. **Pseudocolli-**



**culum:** Absent. **Ostium** and **cauda:** Undifferentiated - sulcus is oval pit-like, may have shallow pit anterior to sulcus. **Ostio-caudal differentiation:** No constrictions. **Collum:** Absent. **Crista superior:** Poorly developed. **Crista inferior:** Well developed, may continue anterior to sulcus. **Dorsal depression:** Absent, area with oval striations across it. **Ventral depression:** Shallow depression near margin at 45 degrees to sulcus in large otoliths. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

#### CERATIIDAE Nelson No. 188

**Family characteristics:** Otoliths small (to c. 3.25 mm OD) elliptic, archaesusulcoid, opening mesial or ostial, homomorph with single, fused, raised colliculum with a slit.

##### Key

- 1a. Single homomorph colliculum, with shallow posterior slit; cristae superior absent; sulcus opening mesial . . . . . *Cryptosaras couesii* 105.3
- 1b. Single homomorph colliculum with deep slit along its length; crista superior present; sulcus opening ostial . . . . . *Ceratas ? tentaculatus* 105.2

#### *Ceratas ? tentaculatus*, SSF No. 105.2 PLATE 36

**DISTRIBUTION:** Known from one specimen off Delagoa Bay, one off southern Natal and a third off Saldanha Bay; throughout southern oceans. Attains 88 cm.

**MATERIAL:** 1/1 (3.25 mm OD, 310 mm TL), PEM 15354 (RUSI 38217); Cape west coast, north-west of St Helena Bay; Id. MEA - tentative as *esca* damaged in trawl.

**Otolith shape:** Blunt elliptic. **Thickness:** Moderately thick. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Slightly rounded; **sculpture**, slightly irregular. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Blunt, oblique and slightly irregular. **Sulcus acusticus:** Ostial, may appear mesial, archaesusulcoid. **Colliculum:** Homomorph, single fused colliculum with slit. **Pseudocolliculum:** Absent. **Ostium** and **cauda:** Undifferentiated with raised colliculum, sulcus deep but poorly defined. **Ostio-caudal differentiation:** No constrictions. **Collum:** Absent. **Crista superior:** Well developed, poor at extremes. **Crista inferior:** Absent. **Dorsal depression:** Absent, area irregular, depressions behind sulcus. **Ventral depression:** Absent. **Rostrum:** Short, sharply rounded. **Antirostrum:** Absent. **Excisura:** Moderate, notch very shallow, angle wide.

#### *Cryptosaras couesii*, SSF No. 105.3 PLATE 36

**DISTRIBUTION:** Known from off Cape of Good Hope, as well as from all major oceans. Attains 44 cm.

**MATERIAL:** 1/1 (1.9 mm OD, 65 mm TL), PEM 13175 (SAM 31588); Cape west coast; lodged in SAM.

**Otolith shape:** Elliptic. **Thickness:** Moderately thin. **Form:** - Mesial flat, - Lateral slightly convex. **Dorsal margin:** Slightly rounded; **sculpture**, slightly irregular. **Ventral margin:** Slightly flattened, slightly irregular. **Posterior margin:** Rounded and entire. **Sulcus acusticus:** Mesial, archaesusulcoid. **Colliculum:** Homomorph, single colliculum with an elongate, posterior pit. **Pseudocolliculum:** Absent. **Ostium** and **cauda:** Undifferentiated, sulcus with colliculum, narrower anteriorly. **Ostio-caudal differentiation:** No constrictions. **Collum:** Absent. **Crista superior:** Absent. **Crista inferior:** Absent. **Dorsal depression:** A shallow depression above sulcus. **Ventral depression:** Continuous with the dorsal depression, below sulcus. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

#### HIMANTOLOPHIDAE Nelson No. 196

**Family characteristics:** Otoliths small, up to c. 3 mm OD. Otolith shape approximately oval, archaesusulcoid with opening mesial but may appear pseudo-ostial. Homomorph, single raised colliculum

with central slit, cristae absent. Description based on single species available, no key provided.

#### *Himantolophus groenlandicus*, SSF No. 108.1

##### PLATE 36

**DISTRIBUTION:** Specimens cast ashore on South African coasts but also found in all major oceans. Attains at least 60 cm.

**MATERIAL:** 2/2 (1.95, 2.7 mm OD, 13142 = 234 mm TL), PEM 12130, 13142 (SAM 31615); Cape west coast; lodged in SAM.

**Otolith shape:** Approximately oval and may be notched. **Thickness:** Moderately thick. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Rounded; **sculpture**, slightly irregular. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Rounded or sharply rounded, notched and slightly irregular. **Sulcus acusticus:** Mesial, may appear pseudo-ostial, archaesusulcoid. **Colliculum:** Homomorph, single raised colliculum with slit. **Pseudocolliculum:** Absent. **Ostium** and **cauda:** Undifferentiated, sulcus has colliculum with slit. **Ostio-caudal differentiation:** No constrictions. **Collum:** Absent. **Crista superior:** Absent. **Crista inferior:** Absent. **Dorsal depression:** Absent. **Ventral depression:** Absent. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

#### ORDER GOBIESOCIFORMES

#### GOBIESOCIDAE Nelson No. 198

**Family characteristics:** Based on the two species available, otoliths small (to c. 1.6 mm OD), otolith characteristics extremely varied. Ostial openings either heterosulcoid or homosulcoid, either heteromorph or no raised colliculi. Cristae poor to absent, rostrum and antirostrum small to large. These marked differences suggest this family may be polyphyletic and in need of revision.

##### Key

- 1a. Otolith square with rounded corners; sulcus homosulcoid with no raised colliculi . . . . .  
 . . . . . *Apletodon pellegrini* 110.1
- 1b. Otolith ovate; sulcus heterosulcoid, colliculi heteromorph . . . . . *Chorisochismus dentex* 110.2

#### *Apletodon pellegrini*, SSF No. 110.1 PLATE 36

**DISTRIBUTION:** Ranges from Senegal, west Africa, to Port Alfred. Attains 50 mm.

**MATERIAL:** 1/1 (0.5 mm OD, 28 mm TL), PEM 6066 (RUSI 17130); Plettenberg Bay; Id. PCH.

**Otolith shape:** Square with rounded corners. **Thickness:** Thin. **Form:** - Mesial flat, - Lateral flat. **Dorsal margin:** Slightly rounded; **sculpture**, entire. **Ventral margin:** Slightly rounded and entire. **Posterior margin:** Slightly rounded and entire. **Sulcus acusticus:** Ostial, homosulcoid. **Colliculum:** No raised colliculi. **Pseudocolliculum:** Absent. **Ostium:** Small and oval. **Cauda:** Oval and shallow. **Ostio-caudal differentiation:** No constrictions. **Ostium/cauda:** 1:0.9. **Collum:** Low and indistinct. **Crista superior:** Very poorly developed. **Crista inferior:** Very poorly developed. **Dorsal depression:** Absent, area smooth. **Ventral depression:** Absent, area smooth. **Rostrum:** Minute, broad and blunt. **Antirostrum:** Absent or minute, broad and rounded. **Excisura:** Moderate, notch absent.

#### *Chorisochismus dentex*, SSF No. 110.2 PLATE 36

**DISTRIBUTION:** Known only from Port Nolloth to northern Natal. Attains 30 cm.

**MATERIAL:** 4/65 (1.3-1.6 mm OD, 123-235 mm TL), PEM 10377, 10477, 10429, 10474; Schoenmakerskop, near Algoa Bay; Id. MJS.



**Otolith shape:** Ovate. **Thickness:** Thin. **Form:** - Mesial very concave, cup-shape, - Lateral very convex. **Lateral surface:** A lump at base of excisural notch. **Dorsal margin:** Domed; **sculpture,** entire. **Ventral margin:** Slightly rounded and entire. **Posterior margin:** Indentate and entire. **Sulcus acusticus:** Ostial, not closed at caudal end, heterosulcoid. **Colliculum:** Heteromorph. **Pseudocolliculum:** Absent. **Ostium:** Large ostium containing irregular colliculum which is indented and pitted in posterior part. **Cauda:** Contains irregular colliculum with slit through it. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:0.6, 1:0.7, 1:0.7, 1:0.6. **Collum:** Absent, step up to cauda. **Crista superior:** Absent. **Crista inferior:** Absent in ostial region, crest-like, uneven and low under cauda, absent at tip. **Dorsal depression:** Absent, area grooved and uneven. Entire central part of otolith depresses from margins, sulcus lies in the middle of the bowl. **Ventral depression:** Absent, area uneven. **Rostrum:** Large, sharply rounded and bowl-like. **Antirostrum:** Large and pointed or sharply rounded. **Excisura:** Wide, notch deep, angle acute.

## ORDER CYPRINODONTIFORMES

### EXOCOETIDAE Nelson No. 200

**Family characteristics:** Otolith shape oval to oblong, to at least 11 mm OD. Sulcus heterosulcoid with narrow ostial opening, colliculum homomorph, usually crystalline and raised with arrow-head ostium flared on dorsal and ventral margins. Caudal tip either flexed or straight and rounded. Dorsal and ventral areas reduced, sulcus usually covers large proportion of surface.

#### Key

- 1a. Otolith oval; margins crenate; sulcus poorly defined and indistinct; ostium only slightly flared . . . . . 2
- 1b. Otolith oval or rounded; margins irregular, not crenate; sulcus distinct; ostium flared dorsally and ventrally . . . . . 3
- 2a. Cauda elongate and poorly defined, almost reaches posterior margin, tip slightly flexed; dorsal and ventral margins of otolith steeply inclined and rough . . . . . *Parexocoetus mento* 116.10
- 2b. Cauda oval and indented, ending well short of posterior margin, tip not flexed; dorsal and ventral margins of otolith not steeply inclined but dentate and crenate . . . . . *Cypselurus oligolepis* 116.-
- 3a. Otolith oval; ostium short, arrow-head shaped; cauda slightly sinuous, tip strongly flexed with pit in tip at flexion . . . . . *Exocoetus volitans* 116.6
- 3b. Otoliths oblong and tapered anteriorly; ostium elongate and arrow-head shaped; cauda straight, tip not flexed . . . . . 4
- 4a. Sulcus very deep; colliculum raised, separated from walls of sulcus with bristle-like crystals . . . . . *Cheilopogon pinnatibarbatus altipennis* 116.4
- 4b. Sulcus not very deep; colliculum not distinctly separate from walls of sulcus, with crystalline structure but not bristle-like . . . . . 5
- 5a. Crista superior and inferior of ostium with wrinkles; caudal tip flared and rounded; dorsal and ventral areas smooth . . . . . *Hirundichthys rondeletii* 116.7
- 5b. Crista superior and inferior not wrinkled; caudal tip rounded, not flared; anterior part of dorsal and anterior ventral areas reduced and striated . . . . . *Cheilopogon cyanopterus* 116.1

### *Cheilopogon cyanopterus*, SSF No. 116.1 PLATE 36

**DISTRIBUTION:** Tropical and subtropical waters of Atlantic, Indian and western Pacific oceans. Recorded locally from Port Alfred and Natal. Attains 34 cm SL.

**MATERIAL:** 2/2 (c. 10.4, 10.6 mm OD, 270, 275 mm SL) PEM 15339, 14275; Comoro Ids; Id. PCH.

**Otolith shape:** Oblong. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded; **sculpture,** irregular. **Ventral margin:** Rounded and very irregular. **Posterior margin:** Sharply rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Homomorph, a single large, uneven colliculum. **Pseudocolliculum:** Absent. **Ostium:** Arrowhead shaped, elongate. Sulcus almost fills mesial surface and runs almost the length of the otolith. **Cauda:** Short, deepening posteriorly, not completely filled by colliculum, tip rounded. **Ostio-caudal differentiation:** Slight dorso-ventral constrictions. **Ostium/cauda:** 1:0.7, 1:0.8. **Collum:** Absent. **Crista superior:** Well developed along cauda, poor over ostium. **Crista inferior:** Well developed along entire length of sulcus. **Dorsal depression:** Small and narrow, dorsal area appears crystalline. **Ventral depression:** Absent, there is a broad, flat area below sulcus which falls away steeply. There may be a shallow groove towards the anterior at 90 degrees to the sulcus. **Rostrum:** Small and pointed. **Antirostrum:** Minute and pointed. **Excisura:** Narrow, notch very shallow, angle acute.

### *Cheilopogon pinnatibarbatus altipennis*, SSF No. 116.4 PLATE 36

**DISTRIBUTION:** From the Cape to Kosi Bay, also on the Agulhas Bank; other subspecies in most subtropical areas. Attains 38 cm SL.

**MATERIAL:** 4/4 (8.54-10.0 mm OD, 280-320 mm SL), PEM 1606, 8340, 1388H, 1389H; Kosi Bay and Tsitsikamma; Id. PCH.

**Otolith shape:** Oblong. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Flattened, may be slightly emarginate; **sculpture,** irregular. **Ventral margin:** Slightly rounded and very irregular. **Posterior margin:** Bluntly rounded with a postero-ventral horn and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Homomorph, single, distinctly raised and crystalline, does not fill the sulcus - separated from walls. **Pseudocolliculum:** Absent. **Ostium:** Flared, mainly dorsally, arrowhead like. Opens antero- dorsally and antero-ventrally, floor of ostium raised in midline of excisura. **Cauda:** Has a slight dorsal flexion and is very deep at tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.1, 1:1.1, 1:1.3, 1:1.4. **Collum:** Absent. **Crista superior:** Well developed over entire sulcus, sulcus deep. **Crista inferior:** Well developed under entire sulcus. **Dorsal depression:** Oval, shallow above neck. **Ventral depression:** Absent, area flattened drops away steeply. **Rostrum:** Small and pointed. **Antirostrum:** Minute, pointed. **Excisura:** Narrow, notch shallow and angle varies.

### *Cypselurus oligolepis* (Bleeker, 1866), SSF No. 116.- PLATE 36

**DISTRIBUTION:** Widely distributed in the tropical Indian Ocean including the Red Sea and the Gulf. Also occurs in the western Pacific Ocean. Attains c. 17 cm SL (Parin & Shirshov 1984).

**MATERIAL:** 1/1 (2.85 mm OD, 77 mm SL), PEM 15395 (RUSI 40558); Mozambique 28°24'S, 34°42'E; Id. PCH.

**Otolith shape:** Approximately oval. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Rounded; **sculpture,** dentate anteriorly and crenate. **Ventral margin:** Rounded and crenate. **Posterior margin:** Sharply rounded, crenate to dentate. **Sulcus acusticus:** Ostial,



heterosulcoid. **Colliculum:** Homomorph, single, extremely low colliculum. **Pseudocolliculum:** Absent. **Ostium:** Oblong, tapering anteriorly and shallow. **Cauda:** Short, oval and shallow, pit-like. **Ostio-caudal differentiation:** Dorsio-ventrally constricted. **Ostium/cauda:** 1:0.5. **Collum:** Absent. **Crista superior:** Poorly developed over ostium, moderately well developed over cauda. **Crista inferior:** Poorly developed under ostium, moderately well developed under cauda. **Dorsal depression:** Indistinct, shallow and irregular over neck. **Ventral depression:** Absent. **Rostrum:** Short and sharply rounded. **Antirostrum:** Minute, sharply rounded. **Excisura:** Narrow, notch very shallow and angle wide.

#### *Exocoetus volitans*, SSF No. 116.6 PLATE 37

**DISTRIBUTION:** Worldwide in tropical waters; occasionally found in this area. Attains 18 cm SL.

**MATERIAL:** 5/10 (3.8-4.9 mm OD, 127-150 mm TL), PEM 8169, 8163, 8165, 8168 (RUSI 34147), 8166 (RUSI 28521); Algoa Bay and Sodwana; Id. MJS, PCH.

**Otolith shape:** Oval. **Thickness:** Moderately thin. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Rounded and raised; sculpture, irregular. **Ventral margin:** Rounded and irregular. **Posterior margin:** Rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Homomorph, single crystalline colliculum. **Pseudocolliculum:** Absent. **Ostium:** Flared slightly dorsally, like an arrow head, colliculum not present at anterior tip. **Cauda:** Slightly sinuous, tip flexed with pit, colliculum fills cauda except at tip. **Ostio-caudal differentiation:** Dorsally constricted. **Ostium/cauda:** 1:1.8, 1:1.8, 1:1.8, 1:2.1, 1:2.2. **Collum:** Absent. **Crista superior:** Well developed over ostium, very poorly developed over cauda. **Crista inferior:** Very poorly developed along entire sulcus. **Dorsal depression:** Absent, area smooth, rim close to margin is rough. **Ventral depression:** Absent, area smooth, rim close to margin is rough. In large otoliths (c. 4.9 mm OD) a very shallow groove close to the margin may be present. **Rostrum:** Very small and pointed. **Antirostrum:** Minute and pointed. **Excisura:** Narrow, notch very shallow, angle varies.

#### *Hirundichthys rondeletii*, SSF No. 116.7 PLATE 37

**DISTRIBUTION:** Widely distributed in southern and northern subtropical waters of all oceans, absent in tropics; common off the Cape. Attains c. 25 cm SL.

**MATERIAL:** 1/1 (7.6 mm OD, 200 mm SL), PEM 6488; locality unknown. **Otolith shape:** Oblong. **Thickness:** Moderately thin. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded; sculpture, irregular. **Ventral margin:** Rounded and very irregular. **Posterior margin:** Bluntly rounded. **Sulcus acusticus:** Ostial, heterosulcoid, deep. **Colliculum:** Homomorph, single crystalline colliculum. **Pseudocolliculum:** Absent. **Ostium:** Flared dorso-ventrally and narrows to a point anteriorly, arrowhead-like, partially filled by colliculum. **Cauda:** Approximately straight, deeper than ostium, slightly flared and rounded tip. **Ostio-caudal differentiation:** Dorsio-ventrally constricted. **Ostium/cauda:** 1:0.7. **Collum:** Absent. **Crista superior:** Poorly developed over ostium, low ridge over anterior cauda becoming well developed near tip. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Shallow above neck, area slightly grooved. **Ventral depression:** Absent, area below ostium is grooved. Flat area below sulcus falls away steeply. **Rostrum:** Small and pointed. **Antirostrum:** Absent. **Excisura:** Narrow, notch absent.

#### *Parexocoetus mento*, SSF No. 116.10 PLATE 37

**DISTRIBUTION:** Tropical Indo-West Pacific and Red Sea; common north of Delagoa Bay; invaded the Mediterranean via the Suez Canal. Attains c. 11 cm SL.

**MATERIAL:** 3/4, two same No. (2.1-3.3 mm OD, 3386 = c. 55 mm SL), PEM 3386, 0034; Natal; lodged in SAM.

**Otolith shape:** Oval. **Thickness:** Moderately thin. **Form:** - Mesial convex, - Lateral concave. **Lateral surface:** Very grooved and uneven. **Dorsal margin:** Rounded; sculpture, crenate. **Ventral margin:** Rounded and crenate. **Posterior margin:** Rounded and crenate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Homomorph, single crystalline colliculum. **Pseudocolliculum:** Absent. **Ostium:** Flared slightly dorsally. Sulcus very poorly defined. **Cauda:** Slightly flexed and deeper than ostium, walls very poorly defined. **Ostio-caudal differentiation:** Very slight dorsal constriction. **Ostium/cauda:** 1:1.1, 1:0.6, 1:0.9. **Collum:** Absent. **Crista superior:** Very poorly developed. **Crista inferior:** Very poorly developed. **Dorsal depression:** Absent, area a raised, smooth plateau with steep and rough edges. **Ventral depression:** Absent, area a raised, smooth plateau with steep and rough edges. **Rostrum:** Very small and pointed. **Antirostrum:** Absent. **Excisura:** Very narrow, notch absent.

#### HEMIRAMPHIDAE Nelson No. 201

**Family characteristics:** Otoliths similar to Belonidae. Otoliths elliptic to oval, pointed anteriorly with heterosulcoid sulcus, ostial opening and low, usually crystalline homomorph colliculum. Ostium characteristically arrowhead shaped, flared on dorsal side only. Up to c. 10 mm OD.

##### Key

- 1a. Otolith elliptic; ostium shallow; caudal tip poorly defined, not flexed; dorsal depression absent. . . . . *Euleptorhamphus viridis* 115.1
- 1b. Otolith oval or elliptic; ostium arrowhead-shaped; caudal tip distinct, usually flexed; may have dorsal depression . . . . . 2
- 2a. Sulcus virtually straight or with slight upward flexion; cauda approximately horizontal to slightly upwardly flexed, tip not down-flexed; dorsal depression absent . . . . . *Hyporhamphus capensis* 115.4
- 2b. Cauda approximately horizontal with down-flexed tip; dorsal depression shallow or absent . . . . . 3
- 3a. Dorsal margin of otolith with tooth at midpoint; dorsal depression small and oval over cauda; crista superior poorly developed and irregular over cauda; caudal tip sharply down-flexed . . . . . *Hemirhamphus far* 115.2
- 3b. Dorsal margin of otolith without tooth; dorsal depression elongate and shallow or absent; crista superior poorly developed along sulcus, not irregular; cauda with slightly flexed tip . . . . . 4
- 4a. Otolith oval and relatively squat; groove on lateral surface under dorsal margin notch in large otoliths (>7mm OD); sulcus broad and well defined; dorsal depression present . . . . . *Hyporhamphus affinis* 115.3
- 4b. Otolith elongate and elliptic, tapering anteriorly; no groove on lateral surface; sulcus relatively narrow and poorly defined; dorsal depression absent . . . . . *Oxyptorhamphus micropterus micropterus* 115.6

#### *Euleptorhamphus viridis*, SSF No. 115.1 PLATE 37

**DISTRIBUTION:** From Table Bay, Algoa Bay and Kei River mouth. Tropical and temperate waters of tropical Indo-Pacific. Attains 40 cm.



**MATERIAL:** 2/4 (2.8, 2.95 mm OD, 101, 105 mm TL), PEM 8170, 8226; Kosi Bay and Sodwana Bay; Id. MJS.

**Otolith shape:** Elliptic to oval. **Thickness:** Thin. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Lateral surface:** Very grooved to margin sculptures. **Dorsal margin:** Rounded; sculpture, crenate. **Ventral margin:** Slightly rounded and crenate or irregular. **Posterior margin:** Rounded and crenate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Homomorph, a single, indistinct colliculum. **Pseudocolliculum:** Absent. **Ostium:** Flares dorsally, walls very poorly defined. **Cauda:** Poorly defined, tip indistinct, slightly deeper than ostium. **Ostio-caudal differentiation:** Slight dorsal constriction. **Ostium/cauda:** 1:1.4, 1:1.4. **Collum:** Absent. **Crista superior:** Extremely poorly developed, absent at tip. **Crista inferior:** Extremely poorly developed. **Dorsal depression:** Absent, area uneven. **Ventral depression:** Absent, area uneven. **Rostrum:** Small and pointed. **Antirostrum:** Absent or minute. **Excisura:** Narrow, notch absent.

#### *Hemiramphus far*, SSF No. 115.2 PLATE 37

**DISTRIBUTION:** Common from Knysna to Delagoa Bay with a few records west to False Bay. Widespread throughout tropical and subtropical waters of Indo-West Pacific. Attains 35 cm.

**MATERIAL:** 4/44 (5.67-9.6 mm OD, 347-500 mm TL), PEM 2970, 6724, 3875, 4865; Natal and Algoa Bay; Id. MJS, HMK.

**Otolith shape:** Elliptic. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Lateral surface:** A ridge behind dorsal margin tooth present. **Dorsal margin:** Slightly rounded; sculpture, entire with a tooth at mid point. **Ventral margin:** Slightly rounded and irregular. **Posterior margin:** Rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Homomorph, a single fused, low colliculum. **Pseudocolliculum:** Absent. **Ostium:** Flared dorsally, like an arrowhead. **Cauda:** Straight with uneven dorsal wall, tip flexed to recurved. **Ostio-caudal differentiation:** Dorsally constricted. **Ostium/cauda:** 1:2.0, 1:1.5, 1:1.4, 1:1.8. **Collum:** Absent. **Crista superior:** Poorly developed and irregular. **Crista inferior:** Poorly developed and irregular. **Dorsal depression:** Small and oval above cauda. **Ventral depression:** Small and oval below cauda. There may be a shallow ventral groove near margin at caudal tip and a pit at the end of the cauda. **Rostrum:** Small and pointed. **Antirostrum:** Absent. **Excisura:** Narrow, notch absent.

#### *Hyporhamphus affinis*, SSF No. 115.3 PLATE 37

**DISTRIBUTION:** Widely distributed in tropical Indo-West Pacific from east coast of Africa south to Sodwana Bay; Red Sea through Indian Ocean islands to Western Australia, New Guinea, Philippines and islands of Oceania. Attains 26 cm.

**MATERIAL:** 2/2 (3.75, 7.26 mm OD, 199, 358 mm TL), PEM 8227, 2709 (RUSI 9509); Kosi Bay and Sodwana; Id. PCH.

**Otolith shape:** Oval. **Thickness:** Moderately thin. **Form:** - Mesial convex, - Lateral slightly concave. **Lateral surface:** Groove under dorsal margin notch in large otoliths. **Dorsal margin:** Slightly rounded, large otoliths (>7mm OD) with notch; sculpture, crenate to irregular. **Ventral margin:** Slightly rounded and crenate to slightly irregular. **Posterior margin:** Slightly rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Homomorph, a single, crystalline colliculum. **Pseudocolliculum:** Absent. **Ostium:** Flared slightly dorsally, like an arrowhead. **Cauda:** Approximately straight with a ventral flexion at tip, filled by the colliculum. **Ostio-caudal differentiation:** Slight dorsal constriction. **Ostium/cauda:** 1:1.9, 1:1.9. **Collum:** Absent. **Crista superior:** Poorly developed along entire sulcus. **Crista inferior:** Poorly developed along entire sulcus. **Dorsal depression:** Small, elongate and shallow over cauda. **Ventral depression:** Absent, with a wide, shallow groove near the margin

in large otoliths. **Rostrum:** Very small and rounded. **Antirostrum:** Absent. **Excisura:** Moderate, notch absent.

#### *Hyporhamphus capensis*, SSF No. 115.4 PLATE 37

**DISTRIBUTION:** A southern African endemic from False Bay to Lake Piti in southern Mozambique. Attains 16 cm.

**MATERIAL:** 4/20 (2.0-3.08 mm OD, 115-165 mm TL), PEM 5939, 5935, 4321 (RUSI 13233), 1387; Cape south coast; Id. MJS, PCH.

**Otolith shape:** Oval. **Thickness:** Thin. **Form:** - Mesial slightly convex, - Lateral flat. **Dorsal margin:** Rounded; sculpture, slightly irregular. **Ventral margin:** Rounded and irregular. **Posterior margin:** Rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Homomorph, a single, fused colliculum, rough in appearance. **Pseudocolliculum:** Absent. **Ostium:** Slight flare of dorsal margin, like an arrowhead. Colliculum not present at anterior tip. **Cauda:** Virtually straight, colliculum fills cauda, tip not flexed. **Ostio-caudal differentiation:** Slight dorsal constriction. **Ostium/cauda:** 1:2.3, 1:1.8, 1:1.7, 1:1.6. **Collum:** Absent. **Crista superior:** Poorly developed along entire sulcus. **Crista inferior:** Very poorly developed along entire sulcus. **Dorsal depression:** Absent. **Ventral depression:** Absent. **Rostrum:** Small and sharply rounded. **Antirostrum:** Absent or minute and rounded. **Excisura:** Narrow, notch minute or absent.

#### *Oxyporhamphus micropterus micropterus*, SSF No. 115.6 PLATE 38

**DISTRIBUTION:** Off Natal and Transkei; widespread throughout Indo-West Pacific between 20°S and 30°N. Attains 185 mm.

**MATERIAL:** 3/3, same No. (3.75-5.38 mm OD, 97-132mm SL), PEM 0529; off Mexico; Id. JEF.

**Otolith shape:** Elliptic. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Slightly rounded; sculpture, irregular to dentate. **Ventral margin:** Slightly rounded and irregular. **Posterior margin:** Rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Homomorph, a single, low colliculum. **Pseudocolliculum:** Absent. **Ostium:** Slight flare of dorsal margin, like an arrowhead. Sulcus poorly defined. **Cauda:** Straight with a strongly flexed tip, filled by colliculum. **Ostio-caudal differentiation:** Slight dorsal constriction. **Ostium/cauda:** 1:1.4, 1:1.5, 1:1.7. **Collum:** Absent. **Crista superior:** Very poorly developed along entire sulcus. **Crista inferior:** Very poorly developed along entire sulcus. **Dorsal depression:** Absent. **Ventral depression:** Absent. **Rostrum:** Small and pointed. **Antirostrum:** Absent. **Excisura:** Very narrow, notch minute.

#### BELONIDAE Nelson No. 202

**Family characteristics:** Otoliths oval to oblong, up to c. 7 mm OD. Archaesulcoid sulcus, straight or slightly sinuous with ostial opening, homomorph with single crystalline or rugose colliculum.

##### Key

- 1a. Colliculum on floor of sulcus smooth or rugose; small pit at nucleus on lateral surface of otolith  
..... *Petalichthys capensis* 113.2
- 1b. Colliculum on floor of sulcus crystalline; lateral surface either with no distinguishing features or with groove  
..... 2
- 2a. Excisural notch moderately long; groove on lateral surface of otolith from nucleus to excisural notch; colliculum reaches anterior margin or excisural notch  
..... *Tylosurus crocodilus crocodilus* 113.4
- 2b. Excisural notch very shallow, no distinguishing features on lateral surface of otolith; colliculum may not reach anterior margin  
..... *Ablennes hians* 113.1



### *Ablennes hians*, SSF No. 113.1 PLATE 38

**DISTRIBUTION:** From Natal south to Algoa Bay. Worldwide in tropical and subtropical waters; in the Atlantic extending south to Mocamedes, southern Angola. Attains 90 cm BL, over 120 cm SL.

**MATERIAL:** 5/13 (3.75-7.0 mm OD, 546-1171 mm TL), PEM 4885, 15572 (RUSI 41956), 5926, 6485, 6508; Gulf of Aqaba, Kosi Bay and Natal; Id. MJS.

**Otolith shape:** Oblong. **Thickness:** Thin. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Slightly rounded; **sculpture,** crenate to irregular. **Ventral margin:** Slightly rounded to flattened, crenate to slightly irregular. **Posterior margin:** Rounded or angled and oblique, irregular. **Sulcus acusticus:** Ostial, archaesusloid. **Colliculum:** Homomorph, single, large, crystalline colliculum. **Pseudocolliculum:** Absent. **Ostium** and **cauda:** Undifferentiated, single colliculum may be absent from anterior and posterior extremities. Sulcus is approximately straight, narrowing anteriorly. **Ostio-caudal differentiation:** Not constricted. **Collum:** Absent. **Crista superior:** Poorly developed. **Crista inferior:** Absent or poorly developed. **Dorsal depression:** Very shallow in larger otoliths. **Ventral depression:** Very shallow in larger otoliths. **Rostrum:** Small and pointed. **Antirostrum:** Minute and rounded. **Excisura:** Narrow, notch shallow, angle acute.

### *Petalichthys capensis*, SSF No. 113.2 PLATE 38

**DISTRIBUTION:** South African endemic; from False Bay to Pondoland (Transkei). Attains 26 cm BL, 35 cm SL.

**MATERIAL:** 4/7 (1.39-3.64 mm OD, 203-350 mm TL), PEM 1442, 0759, 2095, 2094; Algoa Bay and Agulhas Bank; Id. GJBR, ALB.

**Otolith shape:** Oval to oblong. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral flat. **Lateral surface:** Central nucleus pit always present. **Dorsal margin:** Rounded to slightly flattened; **sculpture,** irregular. **Ventral margin:** Flattened and irregular. **Posterior margin:** Rounded and irregular. **Sulcus acusticus:** Ostial, archaesusloid. **Colliculum:** Homomorph, single rugose colliculum fills sulcus. **Pseudocolliculum:** Absent. **Ostium** and **cauda:** Undifferentiated. Sulcus sinuous, flexed at tip. **Ostio-caudal differentiation:** Not constricted. **Collum:** Absent. **Crista superior:** Poorly developed along entire sulcus. **Crista inferior:** Poorly developed. **Dorsal depression:** Absent, area rough. **Ventral depression:** Absent, area rough. **Rostrum:** Short and bluntly pointed or rounded. **Antirostrum:** Absent or minute, small and rounded. **Excisura:** Moderate, notch shallow, angle varied.

### *Tylosurus crocodilus crocodilus*, SSF No. 113.4 PLATE 38

**DISTRIBUTION:** This subspecies is widely distributed in the Atlantic and Indo-West Pacific in tropical and subtropical waters south to Knysna. Attains at least 86 cm BL, 125 cm SL.

**MATERIAL:** 5/16 (3.66-4.8 mm OD, c. 415-462 mm TL), PEM 0323, 2711, 12819 (RUSI 28320), 15329 (RUSI 36881), 8410; Northern Natal and Algoa Bay; Id. MJS, PCH.

**Otolith shape:** Oval to oblong. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Lateral surface:** Groove from nucleus to excisural notch. **Dorsal margin:** Slightly rounded; **sculpture,** crenate. **Ventral margin:** Flattened, irregular or crenate. **Posterior margin:** Rounded, and crenate, posterior ventral margin straight and less crenate. **Sulcus acusticus:** Ostial, archaesusloid. **Colliculum:** Homomorph, single large, slightly crystalline colliculum. **Pseudocolliculum:** Absent. **Ostium** and **cauda:** Undifferentiated, sulcus approximately straight, floor crystalline and walls poorly defined. **Ostio-caudal**

**differentiation:** No constrictions. **Collum:** Absent. **Crista superior:** Poorly developed. **Crista inferior:** Poorly developed. **Dorsal depression:** Absent, area uneven. **Ventral depression:** Absent, area slightly uneven. **Rostrum:** Small, broad and pointed. **Antirostrum:** Small and sharply rounded. **Excisura:** Narrow, notch shallow and angle acute.

### SCOMBERESOCIDAE Nelson No. 203

**Family characteristics:** Only one species available. Otolith small (to c. 2.4 mm OD) ovate, archaesusloid, ostial opening with large rostrum and homomorph, single crystalline colliculum.

### *Scomberesox saurus scomberoides*, SSF No. 114.2 PLATE 38

**DISTRIBUTION:** Circumglobal in southern hemisphere; known along most of our coast. Attains 50 cm SL.

**MATERIAL:** 4/36 (1.5-2.4 mm OD, 180-321 mm TL), PEM 14657, 13960, 10864, 12879 (RUSI 28321); Cape south and west coasts; Id. MJS, PCH.

**Otolith shape:** Ovate. **Thickness:** Thin. **Form:** - Mesial flat, - Lateral flat. **Lateral surface:** Small pit in nucleus region. **Dorsal margin:** Slightly rounded; **sculpture,** slightly irregular. **Ventral margin:** Rounded and approximately entire. **Posterior margin:** Rounded and slightly irregular. **Sulcus acusticus:** Ostial, archaesusloid. **Colliculum:** Homomorph, a single slightly raised, crystalline colliculum. **Pseudocolliculum:** Absent. **Ostium** and **cauda:** Undifferentiated, sulcus shallow with an irregular floor and posterior ventral flexion. **Ostio-caudal differentiation:** Not constricted. **Collum:** Absent. **Crista superior:** Very poorly developed or absent. **Crista inferior:** Very poorly developed. **Dorsal depression:** Absent. **Ventral depression:** Absent. **Rostrum:** Large and sharply rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Wide, notch shallow and angle wide.

### ORDER ATHERINIFORMES

#### ATHERINIDAE Nelson No. 213

**Family characteristics:** Otoliths small (<5 mm OD), discoid to oval, heterosulcoid with short ostium and long cauda, heteromorph with indistinct colliculi.

#### Key

- 1a. Sulcus in midline of otolith; ostium short, flared slightly; cauda horizontal and straight. . . . . *Atherina breviceps* 111.1
- 1b. Sulcus dorsal to midline; ostium bulbous; cauda sinuous and long . . . . . 2
- 2a. Ostium deep and moderately distinct . . . . .  
. . . . . *Atherinomorus lacunosus* 111.3
- 2b. Ostium shallow with very poorly defined walls . . . . .  
. . . . . *Hypoatherina temminckii* 111.6

#### *Atherina breviceps*, SSF No. 111.1 PLATE 39

**DISTRIBUTION:** Appears to have a restricted distribution from Luderitz, Namibia to northern Natal. Attains 11 cm.

**MATERIAL:** 6/35 (2.0-3.1 mm OD, 60-89 mm TL), PEM 2157, 10445, 10446, 4592 (RUSI 14941), 6424, 6425; Algoa Bay, Cape south coast; Id. MJS, PCH.

**Otolith shape:** Circular to oval. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly convex. **Dorsal margin:** Rounded; **sculpture,** irregular to lobed. **Ventral margin:** Rounded and irregular to crenate. **Posterior margin:** Rounded, slightly irregular to crenate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, very low, indistinct colliculi in ostium and cauda. **Pseudocolliculum:** Absent. **Ostium:** Deep and wider than cauda, flared slightly dorso-ventrally. **Cauda:** Deep in centre, straight except dorsal wall flexed



ventrally at tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:2.1, 1:2.2, 1:1.8, 1:2.1, 1:1.8, 1:2.0. **Collum:** Absent, but step up to cauda. **Crista superior:** Well developed over ostium, ridge-like over cauda, poorly developed at posterior. **Crista inferior:** Poorly developed along entire sulcus. **Dorsal depression:** Oval and deep above cauda. **Ventral depression:** Absent, area raised and rough. **Rostrum:** Short, broad and pointed. **Antirostrum:** Very small and rounded. **Excisura:** Moderate, notch shallow, angle varies.

***Atherinomorus lacunosus*, SSF No. 111.3 PLATE 39**

**DISTRIBUTION:** Ubiquitous in Indo-West Pacific to East London but rare south of Natal; Red Sea and eastern Mediterranean. Attains 14cm.

**MATERIAL:** 6/23 (1.7-4.45 mm OD, 56-132 mm TL), 1249H, 1210H, 1245H, PEM 15432 (RUSI 40584), 8303 (RUSI 34146), 1239H, [15433-15435 (all RUSI 40584)]; Gulf of Aqaba, Natal and Mozambique; Id. TH, MJS, PCH.

**Otolith shape:** Discoid to circular. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral: slightly concave. **Dorsal margin:** Rounded, becoming notched posteriorly (c. 4 mm OD); **sculpture,** irregular. **Ventral margin:** Rounded and irregular to crenate. **Posterior margin:** Rounded and irregular. **Sulcus acusticus:** Ostial but in large (c. 4 mm OD) ostio-caudal with a narrow opening to margin, heterosulcoid. **Colliculum:** Heteromorph, very low, indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Ventral wall becoming distinctly bulbous and deep with growth (>2 mm OD). **Sulcus** in dorsal third of otolith. **Cauda:** Slightly sinuous with ventral flexion at tip, may have narrow opening to posterior margin. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:3.2, 1:2.5, 1:3.0, 1:3.5, 1:3.0, 1:3.2. **Collum:** Absent, but step up to ostium. **Crista superior:** Poorly developed over ostium, well-developed to low ridge over cauda. **Crista inferior:** Well developed under ostium and cauda. **Dorsal depression:** Shallow in centre above crista. **Ventral depression:** Absent, shallow groove near margin (>3 mm OD). **Rostrum:** Broad and pointed or rounded. **Antirostrum:** Minute or absent. **Excisura:** Moderate, notch very shallow, deeper in juveniles (<2 mm OD), angle varies.

***Hypoatherina temminckii*, SSF No. 111.6 PLATE 39**

**DISTRIBUTION:** Common in south Pacific, northern Australia, Indian Ocean and Red Sea; south to Delagoa Bay. Attains 12 cm. **MATERIAL:** 3/3 (2.3-2.65 mm OD, 74-77 mm TL), PEM 15576 & 15577 (both RUSI 42687), 2845; Kosi Bay; Id. PCH.

**Otolith shape:** Circular to slightly discoid. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral: slightly concave. **Dorsal margin:** Rounded; **sculpture,** irregular. **Ventral margin:** Well rounded and crenate. **Posterior margin:** Rounded and notched at sulcus. **Sulcus acusticus:** Ostio-caudal, heterosulcoid. **Colliculum:** Heteromorph, low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Shallow, poorly defined, bulbous and deeper than cauda. **Cauda:** Slightly sinuous with slight ventral flexion at tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:2.4, 1:2.3, 1:3.0. **Collum:** Absent, slight step up to cauda. **Crista superior:** Absent over ostium, well developed over cauda. **Crista inferior:** Very poorly developed under ostium, poorly developed under cauda. **Dorsal depression:** Absent, area slightly uneven. **Ventral depression:** Absent, area well rounded, groove near margin. **Rostrum:** Small, broad and sharply rounded. **Antirostrum:** Small and rounded. **Excisura:** Moderate, notch very shallow, angle acute.

**ORDER LAMPRIFORMES**  
**LOPHOTIDAE Nelson No. 220**

**Family characteristics:** Only one species available. Otoliths small (c. 4 mm OD). Rectangular, heterosulcoid, ostio-caudal openings. Homomorph, single anterior colliculum. Rostrum and antirostrum distinct.

***Lophotus lacepede*, SSF No. 121.2 PLATE 39**

**DISTRIBUTION:** Rare; widely distributed in all oceans. Attains 200 cm.

**MATERIAL:** 4/4 (2.6-4.0 mm OD, 6067 = 1130 mm SL, 0725 = 1245 mm TL), PEM 6067, 15337, 14585, 0725; south and south-east coasts of South Africa; Id. MJS.

**Otolith shape:** Approximately rectangular. **Thickness:** Moderately thin. **Form:** - Mesial approximately flat, - Lateral convex. **Lateral surface:** A groove in the centre from the notch. **Dorsal margin:** Flat; **sculpture,** irregular. **Ventral margin:** Flat and irregular. **Posterior margin:** Slightly rounded and lobed. **Sulcus acusticus:** Ostio-caudal, heterosulcoid, not clearly defined. **Colliculum:** Homomorph, a single, irregular, raised colliculum. **Pseudocolliculum:** Absent. **Ostium:** Contains a raised irregular colliculum which extends along the rostrum. **Cauda:** Deep, colliculum only just penetrates it, cauda flared slightly dorsally, poorly defined. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:0.8, 1:0.8, 1:0.5, 1:0.7. **Collum:** Absent. **Crista superior:** Absent over the ostium, poorly developed over the cauda. **Crista inferior:** Ridge-like over the rostrum, poorly developed under cauda. **Dorsal depression:** Absent, area grooved. **Ventral depression:** Absent, area uneven. **Rostrum:** Large and sharply rounded. **Antirostrum:** Large and rounded. **Excisura:** Wide, notch deep, angle acute.

**TRACHTERIDAE Nelson No. 222**

**Family characteristics:** Only one species available. Otolith small (c. 3 mm OD), approximately ovate, heterosulcoid, openings ostio-caudal. Heteromorph, large anterior colliculum penetrates excisura. Only one representative species available to us.

***Trachipterus trachipterus*, SSF No. 119.3 PLATE 39**

**DISTRIBUTION:** Rare but widely distributed from Mediterranean Sea to South Africa (Table Bay), Japan and New Zealand. Attains 213 cm.

**MATERIAL:** 1/1 (2.85 mm OD, 1650 mm TL), 1419H; off Namibia; Id. PCH.

**Otolith shape:** Approximately ovate. **Thickness:** Moderately thick. **Form:** - Mesial concave, - Lateral convex. **Dorsal margin:** Flat; **sculpture,** entire. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Indented and irregular. **Sulcus acusticus:** Ostio-caudal, heterosulcoid. **Colliculum:** Heteromorph. **Pseudocolliculum:** Absent. **Ostium:** Has elongate anterior colliculum penetrating the excisura. **Cauda:** Contains a short posterior colliculum. **Ostio-caudal differentiation:** Slightly dorsally constricted. **Ostium/cauda:** 1:0.5. **Collum:** Absent. **Crista superior:** Broad and uneven ridge. **Crista inferior:** Absent. **Dorsal depression:** Absent. **Ventral depression:** Absent. **Rostrum:** Large and slightly rounded. **Antirostrum:** Small and bluntly rounded. **Excisura:** Wide, notch shallow, angle wide.

**REGALECIDAE Nelson No. 223**

**Family characteristics:** Only one species available. Otoliths extremely small (c. 0.9 mm OD), rectangular, heterosulcoid, ostial, homomorph with single anterior colliculum. Rostrum and antirostrum minute and rounded.



*Agrostichthys parkeri*, SSF No. 122.1 PLATE 39

**DISTRIBUTION:** Southeast Atlantic, New Zealand and Tasmania. Attains 3m.

**MATERIAL:** 1/1 (0.9 mm OD, 610 mm TL), PEM 13182; Cape west coast; lodged in SAM.

**Otolith shape:** Rectangular to oblong. **Thickness:** Moderately thin. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Flat; **sculpture,** slightly irregular. **Ventral margin:** Flat and slightly irregular. **Posterior margin:** Rounded and slightly irregular. **Sulcus acusticus:** Ostial, cauda not closed; heterosulcoid, narrows posteriorly. **Colliculum:** Homomorph, slightly raised anterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Contains colliculum, approximately horizontal and straight. **Cauda:** Deep, tip poorly defined. **Ostio-caudal differentiation:** Slight dorso-ventral constrictions. **Ostium/cauda:** 1:0.7. **Collum:** Absent. **Crista superior:** Well developed along length of sulcus, absent at caudal tip. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Absent, area uneven. **Ventral depression:** Absent, area uneven. **Rostrum:** Minute, rounded. **Antirostrum:** Minute, rounded. **Excisura:** Moderate, notch shallow, angle wide.

**ATELEPODIDAE Nelson No. 225**

**Family characteristics:** Only one species available. Otoliths oval to irregular oblong, irregularly lobed dorsal margin, to c. 8 mm OD. Archaesulcoid, ostial opening, homomorph, sulcus poorly defined.

*Ateleopus natalensis*, SSF No. 124.2 PLATE 40

**DISTRIBUTION:** Cape to Red Sea. Attains 60 cm.

**MATERIAL:** 4/7 (4.1-7.2 mm OD, 80-500 mm SL), PEM 14496 (RUSI 31372), 13060 (RUSI 28332), 12949 (RUSI 28334), 13059 (RUSI 28333), [13046 (RUSI 34088)]; Mozambique and Cape south coast; Id. MJS, PCH.

**Otolith shape:** Oval to irregular oblong. **Thickness:** Moderately thin. **Form:** - Mesial flat, - Lateral slightly convex. **Dorsal margin:** Raised; **sculpture,** irregularly lobed. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Rounded and irregular to lobed. **Sulcus acusticus:** Ostial, but smallest otoliths appear mesial, opening may be very narrow, archaesusulcoid. **Colliculum:** Homomorph, a single, uneven, slightly raised colliculum. **Pseudocolliculum:** Absent. **Ostium and cauda:** Undifferentiated. Sulcus curved ventrally, colliculum lies towards ventral margin. **Ostio-caudal differentiation:** Not constricted. **Collum:** Absent. **Crista superior:** Absent. **Crista inferior:** Well developed under colliculum, absent elsewhere. **Dorsal depression:** Absent, area irregular. **Ventral depression:** Deep depression under colliculum often near margin. **Rostrum:** Large, broad and rounded. **Antirostrum:** Small and rounded to minute. **Excisura:** Narrow to moderate, notch shallow, angle varies.

**ORDER BERYCIFORMES**

**MONOCENTRIDIDAE Nelson No. 229**

**Family characteristics:** Only one species. Otolith moderate in size (to c. 9 mm), shape discoid to square, heterosulcoid, para-ostial opening. Heteromorph with oval anterior colliculum in bulbous ostium and narrower posterior colliculum, angled dorsally.

*Monocentris japonicus*, SSF No. 128.1 PLATE 40

**DISTRIBUTION:** Common in Japan; Indo-West Pacific and Red Sea south to Mossel Bay. Attains 17 cm.

**MATERIAL:** 3/3 (5.7-8.98 mm OD, 85-100 mm TL), PEM 0342, 0142, 0194; Algoa Bay; Id. GJBR.

**Otolith shape:** Discoid to square. **Thickness:** Moderate. **Form:** - Mesial flat, - Lateral slightly convex. **Dorsal margin:** Approximately flat; **sculpture,** slightly irregular. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Approximately straight and slightly irregular. **Sulcus acusticus:** Para-ostial, heterosulcoid. **Colliculum:** Heteromorph, slightly raised anterior and posterior colliculi. **Pseudocolliculum:** Absent. **Ostium:** Oval with a bulbous ventral margin with oval colliculum, with narrow anterior canal to anterior margin. **Cauda:** Dorsally angled, short and narrow, colliculum with raised ventral edge. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:0.7, 1:0.6, 1:0.5. **Collum:** Absent. **Crista superior:** Low ridge along entire sulcus, absent at tip. **Crista inferior:** Very poorly developed under ostium and cauda. **Dorsal depression:** Shallow, large and oval, covers most of dorsal area. **Ventral depression:** Absent. **Rostrum:** Short, broad and rounded. **Antirostrum:** Short, broad and blunt. **Excisura:** Very narrow, notch shallow, angle acute.

**TRACHICHTHYIDAE Nelson No. 230**

**Family characteristics:** Otoliths large, up to c. 17 mm OD, shapes either highly irregular with emarginate margins, or discoid with lobed or digitate dorsal margin. Heterosulcoid, either ostial or ostio-caudal openings, cristae poorly developed. Heteromorph, anterior colliculum oval and broad, posterior, narrower and elongate.

**Key**

- 1a. Otolith discoid; dorsal margin rounded and irregular to digitate . . . . . *Hoplostethus mediterraneus* 127.4
- 1b. Otolith shape highly irregular; dorsal margin emarginate, notched, may be lobed . . . . . 2
- 2a. Otolith shape irregular, crescentic to oblong; margins emarginate and lobed; ventral margin with two papillae . . . . . *Hoplostethus melanopus* 127.6
- 2b. Otolith rectangular to highly irregular; margins highly eroded, sulcus also becomes eroded; ventral margin with no papillae . . . . . *Hoplostethus atlanticus* 127.2

*Hoplostethus atlanticus*, SSF No. 127.2 PLATE 40

**DISTRIBUTION:** Appears to be anti-tropical in distribution; on both sides of Atlantic Ocean (from Iceland to Morocco and Walvis Bay to off Durban); also reported from south-central Indian Ocean and New Zealand. Attains 69 cm.

**MATERIAL:** 7/68 (4.9-17.0 mm OD, 180-435 mm TL), PEM 14658, 14089, 14098, 13696 (RUSI 28325), 14099, 14104, 13853, [14897 (RUSI 35600)]; Cape west coast; Id. MJS, PCH.

**Otolith shape:** Approximately rectangular initially, becoming very irregular with growth (>8 mm OD), extreme erosion of margins into sulcus, especially the cauda. **Thickness:** Moderately thin. **Form:** - Mesial approximately flat, - Lateral: convex. **Dorsal margin:** Irregularly notched and emarginate; **sculpture,** entire. **Ventral margin:** Irregularly notched and emarginate, entire. **Posterior margin:** Straight and entire. **Sulcus acusticus:** Ostio-caudal large, heterosulcoid. **Colliculum:** Heteromorph, ostial colliculum large and distinct, caudal colliculum low and small. **Pseudocolliculum:** Absent. **Ostium:** Oval, lies along rostrum, contains large colliculum. **Cauda:** Approximately oval, colliculum lies along ventral wall. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.1, 1:1.0, 1:1.2, 1:1.3, 1:0.9, 1:1.1, 1:0.4. **Collum:** May be present, low, especially in small otoliths. **Crista superior:** Poorly developed over cauda, absent over ostium. **Crista inferior:** Absent. **Dorsal depression:** Shallow, postero-dorsally positioned. **Ventral depression:** Very shallow beneath ostium. **Rostrum:** Very large and bluntly rounded. **Antirostrum:** Large and rounded. **Excisura:** Very wide, notch deepening with growth, angle varied.



*Hoplostethus mediterraneus*, SSF No. 127.4 PLATE 40

**DISTRIBUTION:** Namibia to Natal. Reported from both sides of Atlantic Ocean, Mediterranean Sea, Red Sea, Indian Ocean and off south coast of Australia and New Zealand. Attains 30 cm.

**MATERIAL:** 645 (4.3-10.0 mm OD, 70-174 mm TL), PEM 12797, 12721, 14158 (RUSI 28326), 12720 (RUSI 28327), 14756, 14757, [14888 (RUSI 35514), 14949 & 14950 (both RUSI 35517)]; Cape south and west coasts; Id. MJS, PCH.

**Otolith shape:** Approximately discoid, becoming digitate dorsally with growth (>5 mm OD). **Thickness:** Moderately thick. **Form:** - Mesial flat, - Lateral slightly convex. **Dorsal margin:** Rounded; sculpture, lobed to digitate. **Ventral margin:** Rounded and entire with two papillae. **Posterior margin:** Slightly flattened and entire. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, well defined, very low anterior colliculum, posterior colliculum narrow, lying ventrally. **Pseudocolliculum:** Absent. **Ostium:** Flared, oval and bulbous, containing oval colliculum. **Cauda:** Broad, with upward flex, narrow low colliculum lies along ventral margin. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:1.5, 1:1.2, 1:1.3, 1:1.2, 1:1.0, 1:1.1. **Collum:** Absent. **Crista superior:** Well-developed to ridge-like over ostium, poorly developed along cauda. **Crista inferior:** Poorly developed along sulcus. **Dorsal depression:** Very shallow above cauda. **Ventral depression:** Absent. **Rostrum:** Short, broad and pointed. **Antirostrum:** Small and pointed or rounded. **Excisura:** Moderate, notch shallow, angle acute.

*Hoplostethus melanopus*, SSF No. 127.6 PLATE 40

**DISTRIBUTION:** Indo-West Pacific from Indonesia to Natal, also off Namibia and Cape Town. Attains 25 cm.

**MATERIAL:** 3/4 (6.0-7.0 mm OD, 147-165 mm TL), PEM14751, 14632, 14633; Cape west coast; lodged in SAM.

**Otolith shape:** Emarginate, crescentic to oblong. **Thickness:** Moderately thin. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Emarginate; **sculpture,** lobed. **Ventral margin:** Rounded and slightly irregular with two papillae. **Posterior margin:** Slightly rounded with narrow lobe. **Sulcus acusticus:** Ostial, may appear ostio-caudal, heterosulcoid. **Colliculum:** Heteromorph. **Pseudocolliculum:** Absent. **Ostium:** Poorly defined, oval in shape and filled with low oval colliculum. **Cauda:** Poorly defined, approximately oval, colliculum low and narrow lies along ventral margin. **Ostio-caudal differentiation:** Slight dorsal constriction. **Ostium/cauda:** 1:1.2, 1:1.1, 1:1.2. **Collum:** Absent. **Crista superior:** Well developed over sulcus. **Crista inferior:** Very poorly developed. **Dorsal depression:** Shallow, above cauda. **Ventral depression:** Absent. **Rostrum:** Large, broad and rounded. **Antirostrum:** Very small and rounded. **Excisura:** Wide, notch shallow, angle wide.

## ANOMALOPIDAE Nelson No. 231

**Family characteristics:** Only one species. Otolith rhomboidal, small (to c. 4.4 mm), heterosulcoid with para-ostial or para-ostio-caudal openings. Cristae very poorly defined. Heterosulcoid with colliculi different sizes.

*Photoblepharon palpebratus steinitzi*, SSF No. 129.1  
PLATE 41

**DISTRIBUTION:** Not yet recorded from southern Africa. Known from the Comoro Ids and Red Sea. Attains 10 cm.

**MATERIAL:** 2/2 (3.9, 4.4 mm OD, 85, 90 mm TL), PEM 14255, 14254; Comoro Ids; Id. MJS, PCH.

**Otolith shape:** Rhomboidal. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly convex. **Dorsal margin:** Rounded; **sculpture,** slightly irregular. **Ventral margin:** Well rounded and slightly irregular. **Posterior margin:** Sharply

rounded and slightly irregular. **Sulcus acusticus:** Para-ostial or para-ostio-caudal, heterosulcoid. **Colliculum:** Heteromorph, colliculi vary greatly in size. **Pseudocolliculum:** Absent. **Ostium:** Flared, larger than cauda, contains large colliculum and almost closed anteriorly. **Cauda:** Narrower, short with small, low colliculum, tip may open to posterior margin. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:0.4, 1:0.3. **Collum:** Absent. **Crista superior:** Poorly developed over ostium, absent over cauda. **Crista inferior:** Absent. **Dorsal depression:** A groove present above flat area but below ridge on margin. **Ventral depression:** Absent, shallow ventral groove near margin. **Rostrum:** Short broad and sharply rounded. **Antirostrum:** Absent. **Excisura:** Narrow, notch absent.

## DIRETMIDAE Nelson No. 232

**Family characteristics:** Otoliths triangular or tall up to c. 10 mm OD. Heterosulcoid with either ostio-caudal or para-ostial openings, cauda not closed. Heteromorph.

### Key

- 1a. Otolith triangular; sulcus opening ostio-caudal . . . . .  
*Diretmoides parini* 130.1
- 1b. Otolith tall; sulcus opening para-ostial . . . . .  
*Diretmus argenteus* 130.2

*Diretmoides parini*, SSF No. 130.1 PLATE 41

**DISTRIBUTION:** Tropical to temperate in Atlantic Ocean, leaving a gap between 7°N and 17°S; probably circumglobal in southern oceans. Attains 40 cm.

**MATERIAL:** 3/3 (6.0-7.8 mm OD, 80-126 mm SL), PEM 12008, 13271, 12011; Cape west coast; lodged in SAM.

**Otolith shape:** Triangular. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly convex. **Dorsal margin:** Flattened; **sculpture,** crenate to irregular. **Ventral margin:** Pointed and serrate. **Posterior margin:** V-shaped and irregular. **Sulcus acusticus:** Ostio-caudal, heterosulcoid. **Colliculum:** Heteromorph. **Pseudocolliculum:** Absent. **Ostium:** Flared ventrally, large colliculum has raised dorsal edge. **Cauda:** Straight, narrow, no wall at tip of cauda, smaller oval colliculum, posteriorly situated. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.2, 1:1.5, 1:1.6. **Collum:** Absent. **Crista superior:** Well developed over ostium, low ridge in mid-section, absent at caudal tip. **Crista inferior:** Poorly developed under ostium, low ridge in mid section, absent posteriorly. **Dorsal depression:** Small, oval and shallow. **Ventral depression:** Absent, margin grooved. **Rostrum:** Small, broad and pointed. **Antirostrum:** Small and sharply rounded. **Excisura:** Narrow, notch shallow, angle acute.

*Diretmus argenteus*, SSF No. 130.2 PLATE 41

**DISTRIBUTION:** Eurytropical in all oceans. Attains 15 cm.

**MATERIAL:** 4/20 (4.0-9.6 mm OD, 55-129 mm TL), PEM 14295, 14293, 13197, 13137; Cape west coast; lodged in SAM.

**Otolith shape:** Tall, dorso-ventrally oval. **Thickness:** Moderately thin. **Form:** - Mesial flat, - Lateral slightly convex. **Dorsal margin:** Rounded; **sculpture,** lobed to digitate. **Ventral margin:** Rounded to pointed and serrate. **Posterior margin:** Slightly rounded and irregular. **Sulcus acusticus:** Para-ostial, caudal region not closed but does not reach margin, heterosulcoid. **Colliculum:** Heteromorph, anterior colliculum oval, posterior colliculum narrower and low with raised ventral edge. **Pseudocolliculum:** Absent. **Ostium:** Deep, ventrally flared, bulbous, closed to margin except for narrow channel, contains oval colliculum. **Cauda:** Short and broad, tip not closed, low narrow colliculum lies along ventral margin. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:1.0, 1:1.3, 1:0.9, 1:1.0. **Collum:** Absent. **Crista superior:** Well-developed over ostium, low ridge



over cauda. **Crista inferior:** Poorly developed under ostium, very poor under cauda. **Dorsal depression:** Oval, above crista. **Ventral depression:** Absent. **Rostrum:** Minute and rounded. **Antirostrum:** Absent. **Excisura:** Narrow, notch absent.

#### ANOPOLOGASTRIDAE Nelson No. 233

**Family characteristics:** One species available. Otolith tall, moderately small (to c. 4 mm OD), archaesusloid, openings ostio-caudal. No raised colliculi. Cristae absent and sulcus very poorly defined.

##### *Anoplogaster cornuta*, SSF No. 131.1 PLATE 41

**DISTRIBUTION:** In Agulhas Current to about 29°S; north of 35°S off West Coast (?outside Benguela Upwelling Region). World-wide between 46°N and 46°S. Attains c. 15 cm.

**MATERIAL:** 3/3 (3.4-4.2 mm OD, 0541 = 114 mm SL, 13138 = 114 mm TL), PEM 0541, 0932, 13138; California and Cape west Coast; Id. JEF, PAH.

**Otolith shape:** Tall. **Thickness:** Thin. **Form:** - Mesial slightly concave, - Lateral slightly convex. **Dorsal margin:** Rounded; sculpture, lobed. **Ventral margin:** Keeled and lobed. **Posterior margin:** Angular and lobed. **Sulcus acusticus:** Ostio-caudal, archaesusloid. **Colliculum:** No raised colliculi. **Pseudocolliculum:** Absent. **Ostium** and **cauda:** Undifferentiated, sulcus broad and shallow with bulging ventral margin and approximately horizontal dorsal margin. **Ostio-caudal differentiation:** Not constricted. **Collum:** Absent. **Crista superior:** Absent. **Crista inferior:** Absent. **Dorsal depression:** Shallow area with shallow grooves from margin. **Ventral depression:** Absent, area slightly grooved. **Rostrum:** Short, broad and lobed. **Antirostrum:** Absent or minute and broad. **Excisura:** Narrow, notch shallow, angle wide.

#### BERYCIDAE Nelson No. 234

**Family characteristics:** Two species available. Otoliths large (up to c. 13 mm OD), shape approximately triangular with keeled ventral margin. Heterosulcoid and ostial, cauda not distinctly closed, may be ostio-caudal. Heteromorph colliculi.

#### Key

- 1a. Otolith shape approximately triangular; ventral keel angular and margin crenate; ostium elongate, oblong; caudal tip flared . . . . . *Beryx splendens* 126.2
- 1b. Otolith shape rounded triangular; ventral keel rounded and margin irregular; ostium ventrally bulbous, oval; caudal tip narrow . . . . . *Centroberyx spinosus* 126.3

##### *Beryx splendens*, SSF No. 126.2 PLATE 41

**DISTRIBUTION:** Both sides of Atlantic; also Australia, Japan and Hawaii; in this area from Saldanha Bay to Natal. Attains 45 cm.

**MATERIAL:** 4/41 (9.0-12.6 mm OD, 191-365 mm TL), PEM 14721, 14192, 14198, 14193; Cape west coast; Id. MJS.

**Otolith shape:** Approximately triangular. **Thickness:** Thin. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Flattened; sculpture, irregular or crenate. **Ventral margin:** Keeled and irregular to crenate. **Posterior margin:** Sharply rounded and lobed. **Sulcus acusticus:** Ostial, occasionally ostio-caudal, heterosulcoid. **Colliculum:** Heteromorph, large anterior colliculum, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Elongate and contains oval colliculum. **Cauda:** Approximately straight with poorly defined tip, may sometimes be open onto margin. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:0.7, 1:0.6, 1:0.9, 1:0.9. **Collum:** Absent. **Crista superior:** Ridge-like along entire sulcus length, absent at tip. **Crista inferior:** Very poor under ostium, poorly developed under cauda. **Dorsal depression:** Oval above crista. **Ventral depression:** Absent, area slightly grooved. **Ro-**

**trum:** Large, broad and sharply rounded. **Antirostrum:** Small and rounded. **Excisura:** Moderate, notch shallow, angle wide.

##### *Centroberyx spinosus*, SSF No. 126.3 PLATE 42

**DISTRIBUTION:** Known only from off Storms River to Durban. Attains 20 cm.

**MATERIAL:** 2/2 (7.11, 10.66 mm OD, 92, 152 mm SL), PEM 14913 (RUSI 35562), 1575H; Natal and Cape south coast; Id. MJS, PCH.

**Otolith shape:** Oval to rounded triangular. **Thickness:** Moderately thick. **Form:** - Mesial slightly convex, - Lateral convex. **Dorsal margin:** Slightly rounded; sculpture, very irregular. **Ventral margin:** Keeled and slightly irregular to irregular. **Posterior margin:** Sharply rounded, approximately entire. **Sulcus acusticus:** Ostial but cauda not closed, heterosulcoid. **Colliculum:** Heteromorph, distinct ostial colliculum and a less distinct caudal colliculum. **Pseudocolliculum:** Absent. **Ostium:** Ventrally bulbous, almost filled with low oval colliculum. **Cauda:** Flexion at tip, not closed, contains a low, centrally depressed colliculum. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:0.9, 1:1.2. **Collum:** Absent, step up to cauda. **Crista superior:** Ridge-like over neck, well developed elsewhere, absent at tip. **Crista inferior:** Well developed along sulcus. **Dorsal depression:** Large and shallow, covers almost entire area. **Ventral depression:** Absent, slight ventral groove at margin. **Rostrum:** Very broad short and rounded. **Antirostrum:** Small and sharply rounded, or absent. **Excisura:** Moderate, notch shallow or absent.

#### HOLOCENTRIDAE Nelson No. 235

**Family characteristics:** The two subfamilies, Holocentrinae and Myripristinae have otoliths which fall into two distinct groups. The Holocentrinae are oval-ovate, up to c. 9 mm OD, usually with emarginate posterior margin, heterosulcoid, homomorph with single, oval anterior colliculum, opening ostial, cauda flexed. Ostium is bulbous ventrally with straight dorsal wall. The Myripristinae have rounded triangular otoliths up to about 18 mm OD, heterosulcoid, usually with a hammerhead ostium, complex, forked cauda, with heteromorph colliculi. Broad ventral and reduced dorsal area. Opening ostial and moderate, onto dorsal margin. These differences suggest that the subfamilies should be raised to family status.

#### Key

- 1a Otoliths oval, oblong or ovate: Holocentrinae . . . . . 2
- 1b Otoliths roundly triangular: Myripristinae . . . . . 9
- 2a Otolith broad with wide ventral area; ventral margin angularly keeled; cauda sharply flexed at about half its length . . . . . *Sargocentron spiniferum* 132.16
- 2b Otoliths narrower with narrower ventral area; ventral margin rounded or slightly rounded; cauda not sharply flexed . . . . . 3
- 3a Otolith elongate and narrow; ostium slightly emarginate in excisura; ridge on lateral surface of otolith under excisural notch . . . *Sargocentron punctatissimum* 132.13
- 3b Otoliths not distinctly elongate and narrow; ostium not emarginate, may be slightly notched; lateral surface without distinguishing features . . . . . 4
- 4a Otolith oval; cauda angled diagonally across otolith, cauda slightly flexed; posterior margin of otolith rounded . . . . . *Sargocentron inaequalis* 132.7
- 4b Otoliths oval-ovate, not oval; cauda horizontal then flexed; posterior margin usually emarginate . . . . . 5



- 5a. Dorsal margin of otolith and area above dorsal depression crenate; cauda strongly flexed with narrow tip; ventral area of otolith rounded, wide and emarginate posteriorly with horned corners . . . . . *Sargocentron melanospiros* 132.10
- 5b. Dorsal margin of otolith usually not crenate; cauda gently flexed or sharply flexed with wider tip; ventral area wide and margin more angled, or area narrower . . . . . 6
- 6a. Crista superior distinct, broad and ridge-like; dorsal area reduced and depressed but raised posteriorly over flexion; cauda flexed near tip; otolith moderately narrow; posterior margin lobed and emarginate . . . . . *Neoniphon sammara* 132.4
- 6b. Crista superior well developed; dorsal area, if depressed, not raised posteriorly; cauda flexed in posterior half or third; otolith moderately broad; posterior margin not lobed if emarginate . . . . . 7
- 7a. Ostium elongate; dorsal margin of anterior cauda curved and sinuous; ventral margin of otolith rounded; dorsal area with ridge in mid-area . . . . . *Sargocentron praslin* 132.12
- 7b. Ostium short and bulbous ventrally; cauda approximately straight before flexion; ventral margin of otolith rounded or angular; dorsal area with no ridge . . . . . 8
- 8a. Ventral area large; ventral margin usually rounded; cauda strongly flexed with elongate tip; posterior margin usually notched . . . *Sargocentron caudimaculatum* 132.5
- 8b. Ventral area moderate; ventral margin usually angular; cauda not strongly flexed with relatively short tip; posterior margin of otolith may be slightly emarginate or notched . . . . . *Sargocentron diadema* 132.6
- 9a. Otoliths approximately lunate to rounded triangular; ostium oval . . . . . *Plectrypops lima* 132.34
- 9b. Otolith distinctly rounded triangular; ostium approximately oval or hammerhead-shaped . . . . . 10
- 10a. Ostium approximately oval; ventral margin of otolith a distinctly rounded keel; ventral margin is emarginate on anterior and posterior side of ventral keel . . . . . *Ostichthys kaianus* 132.33
- 10b. Ostium hammerhead-shaped with posteriorly directed dorsal and ventral lobes; ventral margin has less waisted appearance to ventral keel . . . . . 11
- 11a. Ventral lobe of ostium very elongate and posteriorly directed . . . . . *Myripristis chryseres* 132.22
- 11b. Ventral lobe of ostium not distinctly elongate; about 6 species very similar and difficult to separate without otolith material for comparison because of intraspecific variability and similarity in features: *Myripristis berndti* 131.21, *M. hexagona* 132.23, *M. kuntzei* 132.24, *M. melanosticta* 132.25, *M. murdjan* 132.26, *M. pralinia* 132.27.

#### *Neoniphon sammara*, SSF No. 132.4 PLATE 42

**DISTRIBUTION:** Tropical Indo-West Pacific from the Red Sea to Hawaii and the Pitcairn Group, Australia and Japan; south to Durban. Attains 30 cm.

**MATERIAL:** 3/4 (1044H = 6.54 mm OD, 230 mm TL, rest broken), 1292H, 1177H, 1044H; Gulf of Aqaba and Red Sea; Id. TH, IP.

**Otolith shape:** Ovate. **Thickness:** Moderately thin. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Flat, rising towards posterior; **sculpture**, irregular. **Ventral margin:** Rounded and crenate. **Posterior margin:** Emarginate and lobed. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Homomorph, single

anterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Approximately oval with raised, oval colliculum. **Cauda:** Narrow, ventrally flexed. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1044H = 1:1.7. **Collum:** Absent, slight step up to cauda. **Crista superior:** Ridge-like from posterior ostium to caudal tip. **Crista inferior:** Absent at ostial tip, well developed elsewhere. **Dorsal depression:** Elongate, along the length of crista. **Ventral depression:** Absent, area under ostium slightly rippled. **Rostrum:** Large, broad and rounded. **Antirostrum:** Very small and rounded. **Excisura:** Wide, notch shallow, angle acute.

#### *Sargocentron caudimaculatum*, SSF No. 132.5 PLATE 42

**DISTRIBUTION:** Red Sea and Indo-Pacific; south to Xora River mouth, Transkei; relatively common at Sodwana Bay. Attains c. 25 cm.

**MATERIAL:** 5/15 (3.7-8.24 mm OD, 74-245 mm TL), PEM 14273, 2905, 4382, 2651, 3923 (RUSI 16086); Natal and the Comoro Ids; Id. MJS, PCH.

**Otolith shape:** Oval becoming approximately ovate. **Thickness:** Moderately thin. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Rounded becoming flattened; **sculpture**, irregular. **Ventral margin:** Rounded and irregular to crenate. **Posterior margin:** Straight (c. 3 mm OD) to notched or emarginate with growth (>c. 5 mm OD). **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Homomorph, single low anterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Flared and contains low colliculum. **Cauda:** Strongly flexed at about half its length. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:1.4, 1:1.5, 1:1.1, 1:1.8, 1:1.6. **Collum:** Absent, step up to cauda. **Crista superior:** Very well developed from posterior ostium to mid-cauda, well developed after flexion. **Crista inferior:** Poor at extreme anterior, well developed elsewhere. **Dorsal depression:** Elongate and area uneven, close to margin. **Ventral depression:** Absent, area smooth to rippled. **Rostrum:** Large and broad, sharply rounded. **Antirostrum:** Absent or very small and sharply rounded. **Excisura:** Wide, notch shallow, angle wide.

#### *Sargocentron diadema*, SSF No. 132.6 PLATE 42

**DISTRIBUTION:** Wide ranging in the Indo-Pacific; south to East London. Attains 17 cm.

**MATERIAL:** 4/22 (3.8-6.28 mm OD, 86-173 mm TL), PEM 14264, 2866, 6667 (RUSI 21202), 2865, [8664 (RUSI 37455)]; Sodwana, Natal and Comoro Ids; Id. MJS, PCH.

**Otolith shape:** Oval becoming ovate. **Thickness:** Moderately thin. **Form:** - Mesial convex, - Lateral slightly concave. **Dorsal margin:** Slightly rounded to flattened; **sculpture**, slightly irregular. **Ventral margin:** Rounded becoming angular, very slightly irregular. **Posterior margin:** Rounded to emarginate, dorsal corner rounded and crenate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Homomorph, single low anterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Dorsal margin straight, ventral bulbous, containing oval colliculum. **Cauda:** Narrow and flexed in posterior third. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:1.3, 1:1.3, 1:1.4, 1:1.5. **Collum:** Absent, step up to cauda. **Crista superior:** Anteriorly well developed to ridge-like, well developed at tip. **Crista inferior:** Poor under ostium, well developed under cauda. **Dorsal depression:** Elongate and shallow above crista. **Ventral depression:** Absent, area smooth. **Rostrum:** Large and slightly rounded. **Antirostrum:** Absent or small and rounded. **Excisura:** Wide, notch shallow, angle wide.



***Sargocentron inaequalis*, SSF No. 132.7 PLATE 42**

**DISTRIBUTION:** Known only from Chagos Archipelago, Comoro Ids and the Seychelles. Attains 7 cm.

**MATERIAL:** 1/1 (4.7 mm OD, 97 mm TL), PEM 14223 (RUSI 30602); Comoro Ids; Id. PCH.

**Otolith shape:** Oval. **Thickness:** Moderately thin. **Form:** - Mesial convex, - Lateral slightly concave. **Dorsal margin:** Slightly rounded; **sculpture**, slightly undulating. **Ventral margin:** Well rounded and entire. **Posterior margin:** Rounded and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Homomorph, single anterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Dorsal wall straight, ventral bulbous, containing a low, oval, uneven colliculum. **Cauda:** Narrow, gently flexed, ending close to postero-caudal margin. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:1.6. **Collum:** Absent, step up to cauda. **Crista superior:** Well developed over ostium and anterior cauda, less well developed from flexion. **Crista inferior:** Poorly developed under entire sulcus. **Dorsal depression:** Elongate and shallow, close to margin. **Ventral depression:** Absent, area smooth. **Rostrum:** Large, broad and rounded. **Antirostrum:** Minute and rounded to absent. **Excisura:** Wide, notch shallow and angle wide or notch absent.

***Sargocentron melanospilos*, SSF No. 132.10 PLATE 42**

**DISTRIBUTION:** Red Sea and western Indian Ocean, (Seychelles, Aldabra and Zanzibar) to Japan, Australia, New Caledonia and American Samoa, probably occurs in this area. Attains 20 cm, (25 cm in Japan).

**MATERIAL:** 1/1 (8.72 mm OD, 231 mm TL), 1045H; Nuweiba; Id. as *Holocentrus cornutus* by TH.

**Otolith shape:** Ovate. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral slightly concave. **Dorsal margin:** Approximately straight; **sculpture**, irregular, crenate in mid-dorsal area. **Ventral margin:** Rounded and crenate. **Posterior margin:** Emarginate, dorsal and ventral corners are horn-like. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Homomorph, single anterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Oval, containing colliculum. **Cauda:** Narrow and straight for about two thirds of length then sharply flexed, close to posterior wall. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:1.6. **Collum:** Absent, step up to cauda. **Crista superior:** Well developed along entire sulcus. **Crista inferior:** Poor under ostium, well developed under cauda. **Dorsal depression:** Elongate, shallow under the crenate part of dorsal margin. **Ventral depression:** Absent, area smooth. **Rostrum:** Large and sharply rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Wide, notch shallow, angle acute.

***Sargocentron prasin*, SSF No. 132.12 PLATE 42**

**DISTRIBUTION:** Indo-West Pacific; no specimens available from south of Ibo, Mozambique (15°S). Attains 25 cm.

**MATERIAL:** 2/2 (5.8, 7.6 mm OD, 148, 222 mm TL), PEM 8664, 5971; ORI.

**Otolith shape:** Ovate. **Thickness:** Moderately thin. **Form:** - Mesial convex, - Lateral slightly concave. **Dorsal margin:** Approximately straight; **sculpture**, irregular. **Ventral margin:** Strongly rounded to angular, slightly crenate. **Posterior margin:** Emarginate, slightly irregular, becomes horned in large otoliths (c. 7 mm OD). **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Homomorph, very low anterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Oval, with slightly raised colliculum. **Cauda:** Narrow with slight sag in mid area, flexed at tip. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:1.2, 1:1.6. **Collum:** Absent, step up to cauda. **Crista superior:** Well developed along entire sulcus. **Crista inferior:** Well developed

along entire sulcus. **Dorsal depression:** Present, irregular along most of dorsal area, which has ridge in centre. **Ventral depression:** Absent, area smooth. **Rostrum:** Large and sharply rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Wide, notch shallow, angle varies.

***Sargocentron punctatissimum*, SSF No. 132.13 PLATE 42**

**DISTRIBUTION:** Red Sea and Indo-Pacific, east to Hawaiian Islands and Easter Island; south to Algoa Bay. Attains 16 cm.

**MATERIAL:** 3/3 (3.8-5.06 mm OD, 94-144 mm TL), PEM 14271, 2671, 2804; Sodwana Bay and Comoro Ids; Id. GRA, MJS, PCH.

**Otolith shape:** Oblong to ovate. **Thickness:** Moderately thin. **Form:** - Mesial convex, - Lateral slightly concave. **Lateral surface:** Raised ridge behind excisural notch. **Dorsal margin:** Approximately flat; **sculpture**, irregular. **Ventral margin:** Slightly rounded and crenate. **Posterior margin:** Slightly rounded, crenate or slightly lobed. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Homomorph, single, slightly raised anterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Approximately oval, narrows anteriorly, with low colliculum. **Cauda:** Narrow with gentle flexion at posterior. **Ostio-caudal differentiation:** Slight dorsal, distinct ventral constriction. **Ostium/cauda:** 1:1.5, 1:1.5, 1:1.3. **Collum:** Absent, step up to cauda. **Crista superior:** Ridge-like along entire length of sulcus. **Crista inferior:** Well developed along entire length of sulcus. **Dorsal depression:** Shallow and elongate above crista. **Ventral depression:** Absent. **Rostrum:** Large and sharply rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Wide, notch shallow, angle wide.

***Sargocentron spiniferum*, SSF No. 132.16 PLATE 43**

**DISTRIBUTION:** Red Sea and east coast of Africa south to Natal, east to French Polynesia and the Pitcairn Group. Attains c. 45 cm.

**MATERIAL:** 3/3 (7.2-10.14 mm OD, 192-420 mm TL), PEM 8337 & 8336 (both RUSI 37489), 15575 (RUSI 42759); Kosi Bay, Eilat; Id. MJS, PCH.

**Otolith shape:** Approximately rhombic. **Thickness:** Moderately thin. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Flattened; **sculpture**, irregular. **Ventral margin:** Angularly keeled, slightly crenate. **Posterior margin:** Emarginate with two horns. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Homomorph, single anterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Approximately oval, filled with colliculum. **Cauda:** Narrow and roughly horizontal, sharply flexed at half the length, lying close to posterior margin. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:1.5, 1:1.4, 1:1.8. **Collum:** Absent, step up to cauda. **Crista superior:** Well developed along entire sulcus. **Crista inferior:** Very poorly developed under anterior ostium, well developed under cauda. **Dorsal depression:** Shallow and close to margin, postero-dorsal corner depressed. **Ventral depression:** Absent. **Rostrum:** Large, broad and sharply rounded. **Antirostrum:** Minute and rounded. **Excisura:** Wide, notch shallow, angle wide.

***Myripristis berndti*, SSF No. 132.21 PLATE 43**

**DISTRIBUTION:** Indo-Pacific and tropical eastern Pacific; south to Natal. Attains 30 cm.

**MATERIAL:** 6/15 (4.75-9.6 mm OD, 67-193 mm TL), PEM 2793, 2867, 2790, 6670 (RUSI 34094), 7707 (RUSI 34094), 4613; Sodwana and Natal; Id. MJS, PCH.

**Otolith shape:** Roundly triangular. **Thickness:** Thick. **Form:** - Mesial slightly convex, - Lateral slightly convex. **Dorsal margin:** Approximately flattened; **sculpture**, irregular. **Ventral margin:** Keeled and sharply rounded and entire. **Posterior margin:** Sharply rounded and slightly irregular. **Sulcus acusticus:** Ostial (may appear ostio-caudal in uncoated otoliths, but cauda is



closed), heterosulcoid. **Colliculum:** Heteromorph, anterior colliculum and complex posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Hammerhead-like, dorso-ventrally tall, filled with low, smooth colliculum. **Cauda:** Complex with forked tail, with posterior colliculum. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:2.7, 1:2.3, 1:1.8, (6670 broken), 1:2.5, 1:1.9. **Collum:** Absent. **Crista superior:** Poorly developed over ostium, narrow and ridge-like outlining cauda. **Crista inferior:** Poorly developed under ostium and central cauda, ridge-like under ventral fork. **Dorsal depression:** Deep behind dorsal fork. **Ventral depression:** Notch-like on posterior margin. **Rostrum:** Small and rounded. **Antirostrum:** Absent. **Excisura:** Narrow, notch absent.

#### *Myripristis chryseres*, SSF No. 132.22 PLATE 43

**DISTRIBUTION:** Known only from Hawaiian Islands, Japan, Samoa, Sri Lanka, Reunion and Aliwal Shoal Natal. Attains 25 cm.

**MATERIAL:** 1/1 (11.5 mm OD, 191 mm SL), PEM 14859 (RUSI 35588); Ramsgate, Natal; Id. MJS, PCH.

**Otolith shape:** Rounded triangular. **Thickness:** Moderately thick. **Form:** - Mesial slightly convex, - Lateral slightly convex. **Dorsal margin:** Flat; **sculpture,** irregular. **Ventral margin:** Keeled and well rounded, emarginate under ostium, entire. **Posterior margin:** Approximately flattened, rounded around the cauda and slightly irregular. **Sulcus acusticus:** Ostial (may appear ostio-caudal), heterosulcoid. **Colliculum:** Heteromorph, anterior and complex posterior colliculi. **Pseudocolliculum:** Absent. **Ostium:** Dorso-ventrally tall, hammerhead-shaped, contains a flat, large colliculum ventral edge extended posteriorly. **Cauda:** Complex with a forked tail, dorsal tail with rugose floor, ventral tail deeper, straighter and narrower. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.9. **Collum:** Rounded and low in neck. **Crista superior:** Poorly developed over ostium, narrow sharp ridge-like over the cauda. **Crista inferior:** Poorly developed under ostium, and mid-cauda, narrow and ridge-like under fork of tail. **Dorsal depression:** Behind dorsal fork, triangular in shape. **Ventral depression:** Elongate notch on posterior margin. **Rostrum:** Large, broad and sharply rounded. **Antirostrum:** Absent. **Excisura:** Narrow, opening along the dorsal edge only, no notch.

#### *Myripristis hexagona*, SSF No. 132.23 PLATE 43

**DISTRIBUTION:** Ranges from Samoa Islands to Inhaca Island, Mozambique. Attains 20 cm.

**MATERIAL:** 1/1 (8.9 mm OD, 195 mm TL), PEM 14552 (RUSI 31410); Mauritius; Id. MJS, PCH.

**Otolith shape:** Roundly triangular. **Thickness:** Moderately thick. **Form:** - Mesial slightly convex, - Lateral convex. **Dorsal margin:** Emarginate; **sculpture,** irregular. **Ventral margin:** Keeled and rounded and approximately entire. **Posterior margin:** Slightly rounded and slightly irregular. **Sulcus acusticus:** Ostial (may appear ostio-caudal), heterosulcoid. **Colliculum:** Heteromorph, anterior and complex posterior colliculi. **Pseudocolliculum:** Absent. **Ostium:** Hammer-head shaped, flexed posteriorly with low colliculum. **Cauda:** Complex, with fork, dorsal fork with rugose floor. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:2.9. **Collum:** Absent. **Crista superior:** Poorly developed over ostium, low ridge from about half the otolith length around to the caudal tip. **Crista inferior:** Poorly developed under ostium and mid-cauda, low and ridge-like under fork. **Dorsal depression:** Behind dorsal fork, semi-circular in shape, small step between ostium and cauda to dorsal margin. **Ventral depression:** Elongate notch in posterior margin. **Rostrum:** Short, broad and rounded. **Antirostrum:** Absent. **Excisura:** Moderate, notch absent.

#### *Myripristis kuntzei*, SSF No. 132.24 PLATE 40

**DISTRIBUTION:** Indo-Pacific, south to Natal. Attains 20 cm.

**MATERIAL:** 4/7 (8.3-9.82 mm OD, 127-195 mm TL), PEM 2792, 14231 (RUSI 30640), 2650, 2791; Sodwana Bay and Comoro Ids; Id. GJBR, PCH.

**Otolith shape:** Approximately roundly triangular. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral convex. **Dorsal margin:** Emarginate to notched; **sculpture,** irregular. **Ventral margin:** Keeled, rounded tip, slightly irregular. **Posterior margin:** Slightly emarginate then rounded and entire. **Sulcus acusticus:** Ostial (may appear ostio-caudal), heterosulcoid. **Colliculum:** Heteromorph with one anterior and complex posterior colliculi. **Pseudocolliculum:** Absent. **Ostium:** Hammer-head shaped, with colliculum, slightly backward-pointing, top flat. **Cauda:** Complex, with forked tip, floor of dorsal fork rugose, dorsal edge not clearly defined. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** (2792 broken), 1:2.1, 1:2.1, 1:1.9. **Collum:** Absent, slight step up to cauda. **Crista superior:** Poorly developed over posterior ostium and mid section, becoming ridge-like over the forked ends. **Crista inferior:** Poorly developed under the ostium and mid-section, low ridge under fork. **Dorsal depression:** Behind dorsal fork. **Ventral depression:** Notch on posterior margin. **Rostrum:** Broad and rounded. **Antirostrum:** Absent. **Excisura:** Moderate, notch absent.

#### *Myripristis melanosticta*, SSF No. 132.25 PLATE 43

**DISTRIBUTION:** Indian Ocean (Sri Lanka, Maldives, Sodwana Bay), to Japan and the New Hebrides. Attains 30 cm.

**MATERIAL:** 1/1 (9.3 mm OD, 203 mm TL), PEM 14232; Comoro Ids; Id. PCH.

**Otolith shape:** Roundly triangular. **Thickness:** Moderately thick. **Form:** - Mesial slightly convex, - Lateral slightly convex. **Dorsal margin:** Emarginate; **sculpture,** irregular. **Ventral margin:** Keeled and rounded and approximately entire. **Posterior margin:** Straight to rounded behind cauda, slightly irregular. **Sulcus acusticus:** Ostial (may appear ostio-caudal), heterosulcoid. **Colliculum:** Heteromorph, one anterior and a posterior complex colliculum. **Pseudocolliculum:** Absent. **Ostium:** Hammerhead-shaped, large ventral lobe, filled with low colliculum. **Cauda:** Complex, forked cauda, dorsal fork with rugose floor, ventral straight and deeper. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:2.1. **Collum:** Low rounded collum. **Crista superior:** Poorly developed over ostium, absent in mid section, low ridge over the caudal forks. **Crista inferior:** Poorly developed under ostium, absent in mid-section, low ridge under the fork. **Dorsal depression:** Behind fork. **Ventral depression:** Notch in posterior margin. **Rostrum:** Large, broad and rounded. **Antirostrum:** Absent. **Excisura:** Moderate, notch absent.

#### *Myripristis murdjan*, SSF No. 132.26 PLATE 43

**DISTRIBUTION:** Red Sea and Indo-West Pacific south to Natal. Attains 27 cm.

**MATERIAL:** 2/10 (7.5, 10.0 mm OD, 8783 = 229 mm TL), PEM 5669, 8783; Kosi and Sodwana Bays; Id. PCH.

**Otolith shape:** Approximately roundly triangular. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral convex. **Dorsal margin:** Emarginate with the postero-dorsal corner slightly raised and rounded; **sculpture,** irregular. **Ventral margin:** Keeled and rounded, slightly irregular. **Posterior margin:** Slightly rounded to cauda, slightly irregular. **Sulcus acusticus:** Ostial, may appear ostio-caudal, heterosulcoid. **Colliculum:** Heteromorph, one anterior, and a caudal complex colliculum. **Pseudocolliculum:** Absent. **Ostium:** Hammerhead-shaped, ventral lobe is



flexed posteriorly. **Cauda:** Complex, forked tail, dorsal tail rugose and wing-like, ventral straight and narrow. Ventral margin of cauda approximately straight. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:2.1, 1:2.1. **Collum:** Absent. **Crista superior:** Poorly developed over ostium and anterior cauda, low and ridge-like elsewhere. **Crista inferior:** Poorly developed under ostium and mid-cauda, low and ridge-like under fork. **Dorsal depression:** Deep behind the dorsal fork. **Ventral depression:** Notch in posterior margin. **Rostrum:** Broad and rounded. **Antirostrum:** Absent. **Excisura:** Moderate, notch absent.

#### *Myrpristis pralinia*, SSF No. 132.27 PLATE 43

**DISTRIBUTION:** Known from the islands of the western Indian Ocean and western Pacific. Attains 20 cm.

**MATERIAL:** 2/3 (7.9, 8.3 mm OD, 146, 155 mm TL), PEM 14256 (RUSI 30681), 14274; Comoro Ids; Id. PCH.

**Otolith shape:** Rounded triangular. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral convex. **Dorsal margin:** Slightly emarginate to flat; **sculpture**, irregular. **Ventral margin:** Keeled and rounded, anteriorly slightly emarginate, approximately entire. **Posterior margin:** Rounded behind cauda and slightly irregular. **Sulcus acusticus:** Ostial (may appear ostio-caudal), heterosulcoid. **Colliculum:** Heteromorph with one anterior and a posterior colliculum complex. **Pseudocolliculum:** Absent. **Ostium:** Hammerhead-like, raised on dorsal margin. **Cauda:** Complex and forked, ventral fork constricted ventrally. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:2.3, 1:2.7. **Collum:** Absent. **Crista superior:** Poorly developed over ostium, absent over anterior cauda, ridge-like along caudal forks. **Crista inferior:** Poorly developed under ostium, poorly developed under cauda. **Dorsal depression:** Slight depression behind dorsal fork, area between ostium and cauda flat. **Ventral depression:** Absent. **Rostrum:** Large, broad and rounded. **Antirostrum:** Absent. **Excisura:** Moderate, notch absent.

#### *Ostichthys kaianus*, SSF No. 132.33 PLATE 44

**DISTRIBUTION:** Probably widely distributed but presently known from Reunion, Indonesia and the Ryukyu Islands (Japan). Attains 36 cm.

**MATERIAL:** 1/1 (18.2 mm OD, 268 mm TL), PEM 14276 (RUSI 33523); Comoro Ids; Id. PCH.

**Otolith shape:** Rounded triangular. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral slightly convex. **Dorsal margin:** Emarginate anteriorly, lobed posteriorly; **sculpture**, irregular. **Ventral margin:** Keeled and rounded, emarginate anteriorly and posteriorly, sculpture entire. **Posterior margin:** Emarginate, slightly rounded behind cauda and entire. **Sulcus acusticus:** Ostial (may appear ostio-caudal), heterosulcoid. **Colliculum:** Heteromorph, one anterior colliculum and one posterior colliculum complex. **Pseudocolliculum:** Absent. **Ostium:** Approximately oval, less hammerhead-like. **Cauda:** Complex fork, dorsal fork reduced, ventral fork elongate. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:2.3. **Collum:** Absent, slight step up to cauda. **Crista superior:** Poorly developed over entire sulcus. **Crista inferior:** Poorly developed under ostium, absent under anterior cauda, low and ridge-like under ventral fork. **Dorsal depression:** Area reduced and notched but depression elongate, behind dorsal fork. **Ventral depression:** Absent. **Rostrum:** Broad and rounded. **Antirostrum:** Absent. **Excisura:** Moderate, notch absent.

#### *Plectrypops lima*, SSF No. 132.34 PLATE 44

**DISTRIBUTION:** Indo-West Pacific, including Easter Island and Hawaiian Islands, south to Natal. Attains 16 cm.

**MATERIAL:** 3/5 (8.0-8.92 mm OD, 105-120 mm TL), PEM 14249 (RUSI 30655), 15592, 2926; Sodwana Bay and Comoro Ids; Id. GRA, PCH.

**Otolith shape:** Approximately rounded triangular to lunate. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral convex. **Dorsal margin:** Emarginate; **sculpture**, lobed and irregular. **Ventral margin:** Rounded and entire. **Posterior margin:** Rounded and entire. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, one anterior and complex posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Oval, filled with low colliculum. **Cauda:** Complex, slightly forked, dorsal fork rounded and reduced, ventral fork flexed and elongate. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.6, 1:1.6, 1:1.3. **Collum:** Absent. **Crista superior:** Poorly developed over entire sulcus. **Crista inferior:** Poorly developed under entire sulcus but absent in central region of cauda. **Dorsal depression:** Postero-dorsal corner depressed. **Ventral depression:** Absent but area has smooth central bulge. **Rostrum:** Moderate and rounded. **Antirostrum:** Absent. **Excisura:** Moderate, notch absent.

#### POLYMIXIIDAE Nelson No. 236

**Family characteristics:** Only one species available. Otolith rhomboidal up to c. 7.5 mm OD, dorsal margin raised and lobed, ventral margin well rounded, with broad ventral area. Heterosulcoid with ostial opening and flexed cauda. Homomorph with single anterior colliculum.

#### *Polymixia berndti*, SSF No. 134.1 PLATE 44

**DISTRIBUTION:** Known from off Natal, Kenya, Philippines, Japan and Hawaii. Attains 16 cm.

**MATERIAL:** 3/4 (5.7-7.5 mm OD, 111-160 mm TL), PEM 13028 (RUSI 28324), 12786 (RUSI 28322), 13029 (RUSI 28323); Mozambique and off Algoa Bay; Id. MJS, PCH.

**Otolith shape:** Approximately rhomboidal. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Slightly raised and angular; **sculpture**, lobed. **Ventral margin:** Well rounded and slightly irregular. **Posterior margin:** Blunt and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Homomorph, single low anterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Ventral wall with dip in centre, flared anteriorly, filled with colliculum. **Cauda:** Narrow with ventral flexion near tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.5, 1:1.3, 1:1.2. **Collum:** Absent. **Crista superior:** Ridge-like above neck, well developed elsewhere. **Crista inferior:** Well developed along entire length. **Dorsal depression:** Shallow depression above neck, area grooved. **Ventral depression:** Absent. **Rostrum:** Short, broad and blunt. **Antirostrum:** Small and sharply pointed. **Excisura:** Moderate, notch shallow, angle varies.

#### MELAMPHAIDAE Nelson No. 238

**Family characteristics:** Otoliths triangular, oval or approximately circular up to c. 4.4 mm OD. Archaesulcoid, mesial or para-ostial otoliths which appear mesial if uncoated. Colliculi either homomorph single colliculi or heteromorph with oval anterior and rod-like posterior colliculi. Sulcus poorly defined in all species.

##### Key

- 1a. Otolith circular or discoid; colliculum homomorph and oval in shape . . . . . 2
- 1b. Otoliths triangular or oval; colliculi heteromorph . . . 3
- 2a. Otolith approximately circular; colliculum homomorph, maybe kidney-shaped; otolith with slightly pointed anterior and posterior margins; ventral margin groove may be present . . . . .  
. . . . . *Scopelogadus mizolepis mizolepis* 133.13.



- 2b. Otolith discoid; colliculum homomorph, oval in shape; anterior margin of otolith notched; ventral margin groove absent . . . . . *Scopelogadus beanii* 133.12.
- 3a. Otolith triangular . . . . . *Poromitra crassiceps* 133.6.
- 3b. Otoliths approximately oval with papillae or points on ventral margin . . . . . 4
- 4a. Ventral margin of otolith with a single posterior papilla; sulcus angled postero-ventrally (c. 45°) . . . . . *Melamphaes simus* 133.5.
- 4b. Ventral margin of otolith with anterior and posterior corners pointed or papillae-like; sulcus approximately horizontal or angled at 45° . . . . . 5
- 5a. Dorsal margin of otolith crenate; ventral margin of otolith with a papilla on anterior and posterior corners; posterior colliculum horizontal, straight and elongate; sulcus horizontal . . . *Sio nordenskjoldii* 133.14
- 5b. Dorsal margin of otolith sinuate and entire; ventral margin pointed at anterior and posterior corners which may look like papillae; posterior colliculum curved and short; sulcus angled at 45° . . . *Poromitra megalops* 133.7.

***Melamphaes simus*, SSF No. 133.5 PLATE 44**

**DISTRIBUTION:** Throughout tropical/subtropical regions of Atlantic, Indian and Pacific Oceans. Attains 29 mm SL.

**MATERIAL:** 2/2 (2.35, 3.0 mm OD, 100, 235 mm SL), 0276H, 0278H; Indian Ocean; Id. AK.

**Otolith shape:** Oval. **Thickness:** Moderately thin. **Form:** - Mesial flat, - Lateral slightly convex. **Dorsal margin:** Rounded; **sculpture**, slightly irregular. **Ventral margin:** Flattened, slightly irregular with posterior papilla. **Posterior margin:** Sharply rounded and irregular. **Sulcus acusticus:** Mesial, archaesusloid, sulcus poorly defined, angled postero-ventrally at about 45°. **Colliculum:** Heteromorph, rounded anterior and rod-like posterior colliculum. **Pseudocolliculum:** Absent. **Ostium and cauda:** Undifferentiated but colliculi present. **Ostio-caudal differentiation:** Not constricted. **Collum:** Absent. **Crista superior:** Absent. **Crista inferior:** Absent. **Dorsal depression:** Absent, groove may be present. **Ventral depression:** Absent, groove present near margin. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

***Poromitra crassiceps*, SSF No. 133.6 PLATE 44**

**DISTRIBUTION:** Throughout all oceans except Arctic Ocean and Mediterranean Sea. Attains 155 mm SL.

**MATERIAL:** 1/1 (4.45 mm OD, 101 mm SL?), PEM 0967; locality unknown; Id. JEF.

**Otolith shape:** Approximately triangular. **Thickness:** Moderately thin. **Form:** - Mesial flat, - Lateral slightly convex. **Dorsal margin:** Raised and slightly rounded; **sculpture**, lobed. **Ventral margin:** Flat, approximately entire. **Posterior margin:** Notched and entire. **Sulcus acusticus:** Ostio-caudal, archaesusloid. **Colliculum:** Heteromorph with square anterior colliculum and small, narrow, ridge-like posterior colliculum. **Pseudocolliculum:** Absent. **Ostium and cauda:** Undifferentiated, sulcus shallow. **Ostio-caudal differentiation:** No constrictions. **Collum:** Absent. **Crista superior:** Well developed and straight. **Crista inferior:** Poorly under entire sulcus. **Dorsal depression:** Above crista superior, over anterior colliculum. **Ventral depression:** In antero-ventral corner fork. **Rostrum:** Large, broad and forked. **Antirostrum:** Small and rounded. **Excisura:** Narrow, notch shallow and angle wide.

***Poromitra megalops*, SSF No. 133.7 PLATE 44**

**DISTRIBUTION:** In eastern Atlantic, Indo-Pacific and eastern equatorial Pacific. Attains 62 mm SL.

**MATERIAL:** 3/3 (2.4-2.45 mm OD, c. 36-c. 41 mm SL), PEM 3421 (SAM 28773), 3435 (SAM 28772), 3482 (SAM 28774); off Transkei; Id. PAH.

**Otolith shape:** Oval. **Thickness:** Moderately thin. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Rounded and sinuous; **sculpture**, entire. **Ventral margin:** Slightly rounded and pointed at anterior and posterior corners (may be papillae), **sculpture** entire. **Posterior margin:** Rounded and entire. **Sulcus acusticus:** Para-ostial (may appear mesial when uncoated), archaesusloid, angled dorso-ventrally at about 45°. **Colliculum:** Heteromorph, with large anterior colliculum, posterior colliculum, low narrow and indistinct. **Pseudocolliculum:** Absent. **Ostium and cauda:** Undifferentiated. **Ostio-caudal differentiation:** No constrictions. **Collum:** Absent. **Crista superior:** Absent. **Crista inferior:** Absent or poorly developed. **Dorsal depression:** Absent, shallow groove-like recess around entire otolith. **Ventral depression:** Absent. **Rostrum:** Short, broad and rounded. **Antirostrum:** Absent to minute and rounded. **Excisura:** Narrow, notch shallow, angle wide.

***Scopelogadus beanii*, SSF No. 133.12 PLATE 44**

**DISTRIBUTION:** In Atlantic, southern Indian and western South Pacific oceans. Attains 122 mm SL.

**MATERIAL:** 2/2 (2.05, 3.5 mm OD, 3487 = 45 mm SL), PEM 3487 (SAM 28766), 0875H; off Transkei (3487) and eastern Australia; Id. RM, PAH.

**Otolith shape:** Discoid. **Thickness:** Moderately thick. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Rounded, may be lobed; **sculpture**, entire. **Ventral margin:** Rounded and entire. **Posterior margin:** Rounded and entire. **Sulcus acusticus:** Para-ostial, may appear mesial, archaesusloid. **Colliculum:** Homomorph, single large, oval colliculum. **Pseudocolliculum:** Absent. **Ostium and cauda:** Undifferentiated. **Ostio-caudal differentiation:** No constrictions. **Collum:** Absent. **Crista superior:** Very poorly developed. **Crista inferior:** Very poorly developed. **Dorsal depression:** Absent. **Ventral depression:** Absent. **Rostrum:** Short, broad and rounded. **Antirostrum:** Short, and rounded. **Excisura:** Narrow, notch shallow, angle wide.

***Scopelogadus mizolepis mizolepis*, SSF No. 133.13 PLATE 44**

**DISTRIBUTION:** In tropical Atlantic and Indian oceans to 20-30°S, and in western and central tropical Pacific, where it intergrades with *S. mizolepis bispinosus*, its eastern Pacific counterpart. Attains 94 mm SL.

**MATERIAL:** 4/5 (1.55-2.7 mm OD, 56-65 mm SL), 0353H, 1328H, 0277H, 1330H; Indian Ocean; Id. AK.

**Otolith shape:** Approximately circular. **Thickness:** Moderately thin. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Rounded; **sculpture**, entire. **Ventral margin:** Slightly flattened and entire. **Posterior margin:** Sharply rounded and entire. **Sulcus acusticus:** Para-ostial, may appear mesial if uncoated, archaesusloid. **Colliculum:** Homomorph, single large colliculum, may be kidney-shaped. **Pseudocolliculum:** Absent. **Ostium and cauda:** Undifferentiated. **Ostio-caudal differentiation:** No constrictions. **Collum:** Absent. **Crista superior:** Absent. **Crista inferior:** Absent or poorly developed. **Dorsal depression:** Absent, may be a groove near margin. **Ventral depression:** Absent, may be a groove near margin. **Rostrum:** Short, broad and rounded. **Antirostrum:** Absent to very small and rounded. **Excisura:** Narrow, notch shallow, angle wide.

***Sio nordenskjoldii*, SSF No. 133.14 PLATE 44**

**DISTRIBUTION:** In south Atlantic and Indian Oceans south of 30°S; several records off South Africa; one record from North Pacific. Attains 115 mm SL.

MATERIAL: 1/1 (3.85 mm OD, c. 40 mm SL), PEM 3477 (SAM 28771); off Transkei; Id. PAH.

**Otolith shape:** Oval. **Thickness:** Moderately thin. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Rounded; sculpture, crenate. **Ventral margin:** Rounded, slightly irregular with two papillae on anterior and posterior 'corners'. **Posterior margin:** Rounded and lobed. **Sulcus acusticus:** Mesial, archaesusloid, horizontal. **Colliculum:** Heteromorph, anterior colliculum oval, posterior rod-like. **Pseudocolliculum:** Absent. **Ostium and cauda:** Undifferentiated, sulcus poorly defined. **Ostio-caudal differentiation:** No constrictions. **Collum:** Absent. **Crista superior:** Absent. **Crista inferior:** Poorly developed under anterior colliculum, absent elsewhere. **Dorsal depression:** Absent. **Ventral depression:** Absent, ventral groove near margin. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

**RONDELETIIDAE Nelson No. 240**

**Family characteristics:** Only one species available. Discoid and small (c. 2.5 mm OD), archaesusloid, opening mesial with no raised colliculum.

***Rondeletia loricata*, SSF No. 136.1 PLATE 45**

**DISTRIBUTION:** Three specimens from Cape coast. Uncommon; Atlantic, Indian and Pacific oceans. Attains 11 cm.

**MATERIAL:** 1/1 (2.5 mm OD, 94 mm TL), PEM 13133; Cape west coast; lodged in SAM.

**Otolith shape:** Discoid. **Thickness:** Moderately thin. **Form:** - Mesial concave, - Lateral convex. **Dorsal margin:** Rounded; sculpture, entire. **Ventral margin:** Rounded and entire. **Posterior margin:** Gently rounded and entire. **Sulcus acusticus:** Mesial, archaesusloid. **Colliculum:** No raised colliculi. **Pseudocolliculum:** Absent. **Ostium and cauda:** Undifferentiated and sulcus is a slight depression in the middle of the otolith. **Ostio-caudal differentiation:** No constrictions. **Collum:** Absent. **Crista superior:** Absent. **Crista inferior:** Absent. **Dorsal depression:** Absent, although whole otolith is bowl-like. **Ventral depression:** Absent. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

**BARBOURISIIDAE Nelson No. 241**

**Family characteristics:** Only one species available. Otolith irregular, oblong and up to at least 5.3 mm OD. Archaesusloid, mesial opening, with no raised colliculi.

***Barbourisia rufa*, SSF No. 137.1 PLATE 45**

**DISTRIBUTION:** Rare; Atlantic Ocean between 56°N and 35°S, Indian Ocean between 5°S and 12°S and Pacific Ocean between 45°N and 22°S. Attains 33 cm.

**MATERIAL:** 1/1 (5.3 mm OD, 274 mm TL), PEM 13327; off Cape west coast; lodged in SAM.

**Otolith shape:** Irregular oblong. **Thickness:** Moderately thin. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Emarginate; sculpture, irregular. **Ventral margin:** Emarginate, rounded and irregular. **Posterior margin:** Rounded and entire. **Sulcus acusticus:** Mesial, archaesusloid. **Colliculum:** No raised colliculi. **Pseudocolliculum:** Absent. **Ostium and cauda:** Undifferentiated, but sulcus is an elongate, oval depression with a deeper posterior ventral margin, anterior is poorly defined. **Ostio-caudal differentiation:** No constrictions. **Collum:** Absent. **Crista superior:** Rounded and ridge-like in the posterior half, well developed anteriorly. **Crista inferior:** Well developed in the posterior, absent in the anterior. **Dorsal depression:** Absent, dorsal area completely reduced. **Ventral depression:** Absent, area uneven. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

**ORDER ZEIFORMES**

**NOTE:** Descriptions of the otoliths of this Order were done after consideration of all the material in the collections. Interpretation of the otolith features differs from previous authors' (e.g. Hecht and Hecht 1978) in that the sulcus is considered to include most of the depressed, central part of the otolith with the cristae being located on the broader parts of the otolith. Interpretations of the colliculum and the presence of the pseudocolliculum in these fishes also differs from previous interpretations. There are considerable differences in otolith structure of this order suggesting different lineages.

**MACRUROCYTTIDAE Nelson No. 244  
(ZENIONTIDAE in SSF)**

**Family characteristics:** A single species available. Otolith oval with two papillae on ventral margin, up to c. 4.4 mm OD. Sulcus archaesusloid, pseudo-ostial or mesial opening, homomorph with anterior colliculum larger, pseudocolliculum present.

***Zenion hololepis*, SSF No. 141.1 PLATE 45**

**DISTRIBUTION:** Caribbean and eastern Atlantic; off Delagoa Bay, and two specimens from off Tanzania. Attains 10 cm.

**MATERIAL:** 2/2 (4.05, 4.4 mm OD, 108, 112 mm TL), PEM 5048, 5049 (both RUSI 13785); off Kenya; Id. PCH.

**Otolith shape:** Oval. **Thickness:** Moderately thin. **Form:** - Mesial slightly concave, - Lateral slightly convex. **Dorsal margin:** Slightly rounded; sculpture, lobed. **Ventral margin:** Slightly rounded with papillae at anterior and posterior "corners", approximately entire. **Posterior margin:** Sharply rounded and lobed. **Sulcus acusticus:** Pseudo-ostial or mesial, pseudo-archaesusloid. **Colliculum:** Approximately homomorph (similar in shape, anterior larger). **Pseudocolliculum:** Present, low ridge. **Ostium and cauda:** Differentiated only by colliculi. **Ostio-caudal differentiation:** No constrictions. **Collum:** Absent. **Crista superior:** Absent. **Crista inferior:** Poorly developed. **Dorsal depression:** Absent. **Ventral depression:** Absent. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

**ZEIDAE Nelson No. 245**

**Family characteristics:** Otoliths either hour-glass or trilobate, up to c. 4 mm OD. Pseudo-archaesusloid, openings ostio-caudal, homomorph or heteromorph with distinct, protruding colliculi and large, bulbous pseudocolliculum. Similarities exist between otoliths of some members of this family and the Oreosomatidae.

**Key**

- 1a. Otolith shape hour-glass; ventral margin of otolith rounded, not notched (like Oreosomatidae) . . . . . *Cyttus traversi* 138.2
- 1b. Otolith shape trilobate; ventral margin of otolith indented or notched and may be very irregular . . . . . 2
- 2a. Ventral margin of otolith deeply indented, usually irregular, with broad ventral lobes; sculpture of ventral margin irregular; usually sulcus completely horizontal; colliculi not flared dorsally . . . . . *Zeus capensis* 138.4
- 2b. Ventral margin of otolith notched, with narrow ventral lobes; sculpture of margin entire or slightly irregular; sulcus not horizontal along its length; anterior colliculum flared dorsally . . . . . 3
- 3a. Dorsal margin of otolith entire and domed but not angled; anterior colliculum semi-circular, knob-like; posterior colliculum bluntly pointed . . . . . *Zenopsis conchifer* 138.3



- 3b. Dorsal margin of otolith raised, slightly irregular to lobed, may be angled; anterior colliculum flatter, flared and ear-like; posterior colliculum acorn-like  
 . . . . . *Zeus faber* 138.5.

***Cyttus traversi*, SSF No. 138.2 PLATE 45**

**DISTRIBUTION:** Walvis Ridge and off Cape Town to Algoa Bay; south coast of Australia and New Zealand. Attains 50 cm.

**MATERIAL:** 1/1 (3.9 mm OD, 191 mm TL), PEM 14425 (RUSI 28328); Cape south coast; Id. MJS, PCH.

**Otolith shape:** Hour-glass. **Thickness:** Moderately thin. **Form:** - **Mesial** uneven, - **Lateral** uneven. **Dorsal margin:** Approximately flat; **sculpture**, irregular. **Ventral margin:** Rounded and irregular. **Posterior margin:** Notched with finger-like projection at midpoint. **Sulcus acusticus:** Ostio-caudal, pseudo-archaesulcoid. **Colliculum:** Homomorph with two colliculi. **Pseudocolliculum:** Present, low ridge on bulge. **Ostium and cauda:** Are similar in shape and have low colliculi which extend as finger-like projections. **Ostio-caudal differentiation:** No constrictions (therefore pseudo-archaesulcoid). **Ostium/cauda:** 1:1.3. **Collum:** Absent. **Crista superior:** Absent. **Crista inferior:** Well developed, rounded and uneven, on the flared ventral third of otolith. **Dorsal depression:** Absent, area uneven. **Ventral depression:** Absent, area uneven. **Rostrum:** Broad and rounded, **pseudo-rostrum:** Broad and rounded. **Antirostrum:** Large and rounded, **pseudo-antirostrum:** Large and rounded. **Excisura:** Wide, notch deep and angle wide, **pseudo-excisura:** Wide, notch deep and angle wide.

***Zenopsis conchifer*, SSF No. 138.3 PLATE 45**

**DISTRIBUTION:** Walvis Bay to Natal and north to India; eastern Atlantic, and off North and South America. Attains 80 cm.

**MATERIAL:** 3/3 (2.6-2.8 mm OD, 421-495 mm TL), PEM 14703, 14704, 14702; Namibia; Id. MJS.

**Otolith shape:** Trilobate. **Thickness:** Moderately thin. **Form:** - **Mesial** uneven, - **Lateral** approximately flat. **Dorsal margin:** Domed and rounded, not angled; **sculpture**, entire. **Ventral margin:** Notched and irregular. **Posterior margin:** Notched and entire with lobe of colliculum protruding into notch. **Sulcus acusticus:** Ostio-caudal, pseudo-archaesulcoid. **Colliculum:** Approximately homomorph, two colliculi. **Pseudocolliculum:** Present as bulge without ridge. **Ostium and cauda:** Not horizontal. Are similar, anterior colliculum broad, flared dorsally, rounded and knob-like, joined by a smooth intracollicular connection to posterior narrow, bluntly pointed colliculum. **Ostio-caudal differentiation:** No constrictions. **Ostium/cauda:** 1:1.5, 1:2.0, 1:1.1. **Collum:** Absent. **Crista superior:** Absent. **Crista inferior:** Absent. **Dorsal depression:** Absent. **Ventral depression:** Absent. **Rostrum:** Large, narrow lobe, angled at 45°, as is **pseudo-rostrum**. **Antirostrum:** Very short, and broad or absent, as is **pseudo-antirostrum**. **Excisura:** Wide, notch shallow, angle wide, as is **pseudo-excisura**.

***Zeus capensis*, SSF No. 138.4 PLATE 45**

**DISTRIBUTION:** St Helena Bay to Natal; endemic to this region. Attains 90 cm.

**MATERIAL:** 6/86 (1.4-2.9 mm OD, 92-314 mm TL), PEM 12646, 12673, 12196 (RUSI 28474), 13435, 12639, 12617; Cape south and west coasts; Id. MJS.

**Otolith shape:** Trilobate. **Thickness:** Moderately thick. **Form:** - **Mesial** uneven, - **Lateral** flat. **Dorsal margin:** Domed and rounded; **sculpture**, entire. **Ventral margin:** Deeply indented to form two broad lobes, **sculpture** irregular. **Posterior margin:** Notched and entire with colliculum protruding into notch. **Sulcus acusticus:** Ostio-caudal, pseudo-archaesulcoid and horizontal. **Colliculum:** Heteromorph; anterior is large and rounded, posterior

is narrow and rod like. **Pseudocolliculum:** Elongate knob without ridge. **Ostium and cauda:** Horizontal, distinguishable only by colliculi, joined by smooth intracollicular connection. **Ostio-caudal differentiation:** Not constricted. **Ostium/cauda:** 1:1.8, 1:2.6, 1:1.4, 1:2.4, 1:1.9, 12196 damaged. **Collum:** Absent. **Crista superior:** Absent. **Crista inferior:** Absent. **Dorsal depression:** Absent. **Ventral depression:** Absent. **Rostrum:** Large and lobed to irregular, as is **pseudo-rostrum**. **Antirostrum:** Absent or minute, as is **pseudo-antirostrum**. **Excisura:** Wide, notch shallow, angle wide, as is **pseudo-excisura**.

***Zeus faber*, SSF No. 138.5 PLATE 45**

**DISTRIBUTION:** Common along this entire coast and north to Kenya; Mediterranean and eastern Atlantic from Norway to South Africa, Australia, New Zealand and Japan. Attains 60 cm.

**MATERIAL:** 3/4 (1.6-2.45 mm OD, 194-400 mm TL), PEM 15003 (RUSI 35575), 0272, 0142H; off Cape south coast and Transkei; Id. MJS, MEA.

**Otolith shape:** Trilobate. **Thickness:** Moderately thin. **Form:** - **Mesial** uneven, - **Lateral** flat. **Dorsal margin:** Raised, angled; **sculpture**, lobed. **Ventral margin:** Notched to form two narrow lobes and entire. **Posterior margin:** Notched with colliculum protruding, entire. **Sulcus acusticus:** Ostio-caudal, pseudo-archaesulcoid. **Colliculum:** Heteromorph, with large, flared, slightly rounded anterior colliculum and narrow acorn-like posterior colliculum. **Pseudocolliculum:** Knob-like, not ridged. **Ostium and cauda:** Not horizontal. Distinguishable only by colliculi which are joined by intracollicular connection. Ostium flares dorsally. **Ostio-caudal differentiation:** No constrictions. **Ostium/cauda:** 1:1, 1:1.2, 1:1.2. **Collum:** Absent. **Crista superior:** Absent. **Crista inferior:** Absent. **Dorsal depression:** Absent. **Ventral depression:** Absent. **Rostrum:** Large and blunt lobe, as is **pseudo-rostrum**. **Antirostrum:** Absent to small and rounded as is **pseudo-antirostrum**. **Excisura:** Wide, notch moderately shallow, angle wide, as is **pseudo-excisura**.

**OREOSOMATIDAE Nelson No. 246**

**Family characteristics:** Otoliths hour-glass shaped, up to c. 8 mm OD, pseudo-archaesulcoid, approximately homomorph, with ridge-like pseudocolliculum. Colliculi approximately rounded and raised, not narrow and rod-like (cf. *Cyttus traversi* 138.2). Crista superior with steep, grooved wall to colliculi. Similar in form to some Zeidae.

**NOTE:** Considerable intraspecific and ontogenetic variation makes separation by key very difficult. Use of whole otoliths compared with whole reference specimens may help to resolve difficulties in prey identification.

***Alloctytus verrucosus*, SSF No. 139.2 PLATE 46**

**DISTRIBUTION:** From Walvis Bay to Mozambique channel; also known from Walvis Ridge, Gulf of Guinea, off Mauritania, western Atlantic and Australia. Attains at least 38 cm.

**MATERIAL:** 6/57 (2.15-7.7 mm OD, 109-360 mm TL), PEM 13878, 14940 (RUSI 35561), 14938 (RUSI 35593), 13838, 14668, 13893, [14475 (RUSI 31446), 14941 (RUSI 35561), 14939 (RUSI 35593)]; west coast and Cape south coast; Id. MJS, MEA.

**Otolith shape:** Hour-glass. **Thickness:** Moderately thin. **Form:** - **Mesial** uneven, - **Lateral** approximately flat. **Dorsal margin:** Raised and rounded; **sculpture**, lobed or irregular. **Ventral margin:** Rounded and dentate becoming irregular. **Posterior margin:** Notched and irregular. **Sulcus acusticus:** Ostio-caudal, pseudo-archaesulcoid. **Colliculum:** Heteromorph becoming homomorph, indented and spectacle-like (c. 7 mm OD). **Pseudocolliculum:** Present as ridge on bulge. **Ostium and cauda:** Distinguishable only by colliculi, which may be joined by an intracollicular connection in smaller otoliths. **Ostio-caudal differentiation:** No



constrictions. **Ostium/cauda:** 1:2, 1:2.1, 1:1.3, 1:1.5, 1:1.6, 1:2.2. **Collum:** Absent. **Crista superior:** Well developed in large otoliths (>3.5 mm OD), poorly developed in small otoliths. **Crista inferior:** Ridge-like in large otoliths (>c. 3.5 mm OD), poorly developed in small otoliths. **Dorsal depression:** Absent. **Ventral depression:** Absent. **Rostrum:** Large, broad and rounded or sharply rounded, as is **pseudo-rostrum**. **Antirostrum:** Large and rounded, as is **pseudo-antirostrum**. **Excisura:** Usually wide, notch deep and angle varied, as in **pseudo-excisura**.

*Neocyttus rhomboidalis*, SSF No. 139.3 PLATE 46

**DISTRIBUTION:** From Walvis Ridge to Cape, also off Argentina and Australia. Attains 34 cm.

**MATERIAL:** 6/65 (2.6-4.6 mm OD, 117-232 mm SL), PEM9178, 13846, 9047 (RUSI 37520), 13845, 13844, 12261, [9057, 9059, 9060 (all RUSI 37515), 9052, 9053 (all RUSI 37520)]; west coast and Cape south coast; Id. MJS, PCH.

**Otolith shape:** Hour-glass. **Thickness:** Moderately thick. **Form:** - Mesial slightly convex, - Lateral slightly convex. **Dorsal margin:** Raised; **sculpture**, trilobed. **Ventral margin:** Rounded and dentate to irregular. **Posterior margin:** Notched and irregular. **Sulcus acusticus:** Ostio-caudal, pseudo-archaesulcoid. **Colliculum:** Approximately homomorph, oval and slightly bulbous, anterior may be flared dorsally. **Pseudocolliculum:** Rod-like. **Ostium and cauda:** Differentiated only by colliculi. **Ostio-caudal differentiation:** No constrictions. **Ostium/cauda:** 1:2.1, 1:1.5, 1:2.1, 1:1.6, 1:1.8, 1:2.3. **Collum:** Absent. **Crista superior:** Rounded and well developed with grooves down to colliculi. **Crista inferior:** Absent. **Dorsal depression:** Shallow depression above crista. **Ventral depression:** Absent. **Rostrum:** Large, broad and rounded or sharply rounded, as is **pseudo-rostrum**. **Antirostrum:** Large and rounded, as is the **pseudo-antirostrum**. **Excisura:** Wide, notch deep, angle acute, as is **pseudo-excisura**.

*Oreosoma atlanticum*, SSF No. 139.4 PLATE 46

**DISTRIBUTION:** Around South Africa between 30° and 35°S, and off Australia. Attains 21 cm.

**MATERIAL:** 3/20 (2.5-3.4 mm OD, 140-184 mm TL), PEM 11406 (RUSI 28331), 11402 (RUSI 28330), 11404, [14942, 14943 (both RUSI 35595)]; Cape south coast; Id. MJS, PCH.

**Otolith shape:** Hour-glass. **Thickness:** Moderately thick. **Form:** - Mesial slightly convex, - Lateral irregular. **Dorsal margin:** Raised; **sculpture**, lobed. **Ventral margin:** Rounded and highly irregular. **Posterior margin:** Notched and irregular. **Sulcus acusticus:** Ostio-caudal, pseudo-archaesulcoid. **Colliculum:** Approximately homomorph, anterior is rounded, posterior is smaller and oval. **Pseudocolliculum:** Raised and uneven. **Ostium and cauda:** Differentiated only by the colliculi. **Ostio-caudal differentiation:** No constrictions. **Ostium/cauda:** 1:1.5, 1:1.7, 1:2.3. **Collum:** Absent. **Crista superior:** Low ridge, steep, deeply grooved wall to colliculi. **Crista inferior:** Absent. **Dorsal depression:** Elongate and shallow above crista. **Ventral depression:** Absent. **Rostrum:** Broad and rounded, as is **pseudo-rostrum**. **Antirostrum:** Large and rounded, as is **pseudo-antirostrum**. **Excisura:** Wide, notch deep and angle acute, as is **pseudo-excisura**.

*Pseudocyttus maculatus*, SSF No. 139.5 PLATE 46

**DISTRIBUTION:** From Walvis Bay to the Cape; also Walvis Ridge, western Atlantic, New Zealand and Southern Ocean. Attains at least 50 cm.

**MATERIAL:** 3/5 (2.5-4.2 mm OD, 154-365 mm TL), PEM 12072, 12071, 14587; west coast; Id. MJS.

**Otolith shape:** Hour-glass. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral irregular. **Dorsal margin:** Raised and rounded; **sculpture**, slightly irregular. **Ventral margin:** Rounded with shallow, irregular indentations. **Posterior**

**margin:** Notched and entire. **Sulcus acusticus:** Ostio-caudal, pseudo-archaesulcoid. **Colliculum:** Homomorph. **Pseudocolliculum:** Present, as low bulge. **Ostium and cauda:** Differentiated only by colliculi. **Ostio-caudal differentiation:** No constrictions. **Ostium/cauda:** 1:2, 1:2.1, 1:1.7. **Collum:** Absent. **Crista superior:** Well developed with grooves to colliculi. **Crista inferior:** Absent. **Dorsal depression:** Oval depression above crista. **Ventral depression:** Absent. **Rostrum:** Large and rounded, as is **pseudo-rostrum**. **Antirostrum:** Large and rounded or sharply rounded, as is **pseudo-antirostrum**. **Excisura:** Wide, notch deep and wide, as is **pseudo-excisura**.

GRAMMICOLEPIDIDAE Nelson No. 247

**Family characteristics:** A single species available. Otoliths hour-glass shaped, pseudo-archaesulcoid with ostio-caudal openings, homomorph with indented colliculi and distinct pseudocolliculum. Ventral margin keeled and sharply rounded.

*Xenolepidichthys dalgleishi*, SSF No. 140.2 PLATE 46

**DISTRIBUTION:** Walvis Bay to Natal; Atlantic and Indo-West Pacific oceans. Attains 15 cm.

**MATERIAL:** 4/10 (1.3-2.5 mm OD, 49-97 mm TL), PEM 13433, 14968 (RUSI 35560), 12796 (RUSI 28329), 12129, [15364 (RUSI 38211)]; west and Cape south coast; Id. MJS, PCH.

**Otolith shape:** Hour-glass. **Thickness:** Moderately thin. **Form:** - Mesial flat, - Lateral flat. **Dorsal margin:** Raised; **sculpture**, lobed. **Ventral margin:** Keeled to sharply rounded and irregular to serrate. **Posterior margin:** Notched and approximately entire. **Sulcus acusticus:** Ostio-caudal, pseudo-archaesulcoid. **Colliculum:** Homomorph, two indented colliculi, similar sized. **Pseudocolliculum:** Low knob with ridge. **Ostium and cauda:** Differentiated only by colliculi. **Ostio-caudal differentiation:** No constrictions. **Ostium/cauda:** 1:1.4, 1:1.6, 1:1, 1:1.1. **Collum:** Absent. **Crista superior:** Absent. **Crista inferior:** Absent. **Dorsal depression:** Absent. **Ventral depression:** Absent. **Rostrum:** Large and sharply rounded, as is **pseudo-rostrum**. **Antirostrum:** Broad and blunt, similar to **pseudo-antirostrum**. **Excisura:** Wide, notch moderate, angle wide, as is **pseudo-excisura**.

CAPROIDAE Nelson No. 248

**Family characteristics:** Only one species. Otoliths ovate to triangular, up to c. 7 mm OD. Heterosulcoid with ostial openings, heteromorph with indistinct colliculi, ostium bulbous.

*Antigonia rubescens*, SSF No. 162.1 PLATE 47

**DISTRIBUTION:** Indo-West Pacific from Natal to Japan. Attains 15 cm.

**MATERIAL:** 5/5 (5.1-6.6 mm OD, 89-112 mm TL), PEM 14984, 14982, 14981, 14983, 14980 (all RUSI 35599); Transkei; Id. MJS, MEA.

**Otolith shape:** Ovate to triangular, shape variable. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral flat. **Lateral surface:** V-shaped depression behind ostium. **Dorsal margin:** Rounded; **sculpture**, irregular, lobed or notched. **Ventral margin:** Rounded, flattened or angular and irregular. **Posterior margin:** Rounded to angled and straight, irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low colliculi, may be indistinct. **Pseudocolliculum:** Absent. **Ostium:** Bulbous ventrally and deeper than cauda. **Cauda:** Straight, tip not distinctly closed, approximately horizontal. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:1.7, 1:1.4, 1:1.7, 1:1.5, 1:1.6. **Collum:** Absent, step up to cauda. **Crista superior:** Well developed over ostium, ridge-like over cauda but absent over tip. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Large and oval becoming deeper with growth. **Ventral depression:** Absent, distinct groove in large otoliths parallel to



margin. **Rostrum:** Small, broad and sharply rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Moderate, notch shallow, angle wide.

## ORDER PEGASIFORMES

### PEGASIDAE Nelson No. 253

**Family characteristics:** Only a single species available. Otoliths discoid and small (c. 1.8 mm OD) with undifferentiated sulcus, archaesusloid. No raised colliculi.

#### *Eurypegasus draconis*, SSF No. 142.1 PLATE 47

**DISTRIBUTION:** Indo-West Pacific to Algoa Bay, rare in our area. Attains 10 cm.

**MATERIAL:** 3/4 (1.35-1.8 mm OD, 68-92 mm TL), PEM 14329 (RUSI 30386), 1212H, 14540 (RUSI 31371); Mauritius and Eilat; Id. MJS, PCH, DF.

**Otolith shape:** Discoid. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral approximately flat. **Dorsal margin:** Rounded; **sculpture,** slightly irregular. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Slightly emarginate and slightly irregular. **Sulcus acusticus:** Pseudo-ostial, archaesusloid. **Colliculum:** No raised colliculi. **Pseudocolliculum:** Absent. **Ostium and cauda:** Undifferentiated. **Ostio-caudal differentiation:** No constrictions. **Collum:** Absent. **Crista superior:** Absent. **Crista inferior:** Ridge-like and uneven. **Dorsal depression:** Absent, area rough and grooved dorso-ventrally. **Ventral depression:** Absent, area may have flattened edge. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

## ORDER SYNGNATHIFORMES

### AULOSTOMIDAE Nelson No. 254

**Family characteristics:** One species. Otoliths rectangular up to c. 2.8 mm OD, homosulcoid, ostio-caudal openings. No raised colliculi.

#### *Aulostomus chinensis*, SSF No. 143.1 PLATE 47

**DISTRIBUTION:** Widespread in Indo-West Pacific region, extends south to East London. Attains 50 cm.

**MATERIAL:** 2/2 (2.65, 2.75 mm OD, 690, 710 mm TL), 0775H, PEM 0499; Cape east coast and Sodwana Bay; Id. MMS.

**Otolith shape:** Rectangular. **Thickness:** Moderately thick. **Form:** - Mesial flat, - Lateral approximately flat. **Dorsal margin:** Flat; **sculpture,** entire. **Ventral margin:** Slightly rounded and irregular. **Posterior margin:** Slightly emarginate and irregular. **Sulcus acusticus:** Ostio-caudal, homosulcoid. **Colliculum:** No raised colliculi. **Pseudocolliculum:** Absent. **Ostium:** Ostial depression flared, deepening posteriorly. **Cauda:** Narrow but flared posteriorly, deeper anteriorly, may have circular pit in cauda. **Ostio-caudal differentiation:** Slight dorsal constriction. **Ostium/cauda:** 1:0.8, 1:1. **Collum:** Bridge-like. **Crista superior:** Ridge-like, broad over collum, narrows distally. **Crista inferior:** Absent. **Dorsal depression:** Triangular deep depression above collum. **Ventral depression:** Absent, area very uneven. **Rostrum:** Broad and sharply rounded. **Antirostrum:** Large and sharply rounded. **Excisura:** Wide, notch deep, angle wide or acute.

### FISTULARIIDAE Nelson No. 255

**Family characteristics:** Based on one species; elongate and rectangular fusiform shape up to c. 7 mm OD. Otoliths very delicate and transparent. Ostio-caudal openings. Rostrum and antirostrum elongate, tapered and pointed.

#### *Fistularia commersonii*, SSF No. 144.1 PLATE 47

**DISTRIBUTION:** Widespread Indo-Pacific species; south to Mossel Bay. Attains 150 cm.

**MATERIAL:** 3/19 (3.85-6.28 mm OD, 960-1200 mm TL, 1095-1310 mm TL (to end of prolonged middle rays), PEM 15716, 15718, 15712; Eilat; Id. MJS, PCH.

**Otolith shape:** Rectangular to fusiform. **Thickness:** Thin and transparent. **Form:** - Mesial concave, - Lateral slightly convex. **Dorsal margin:** Flat; **sculpture,** crenate and slightly irregular. **Ventral margin:** Flat and slightly irregular. **Posterior margin:** Notched or bilobed and slightly irregular. **Sulcus acusticus:** Ostio-caudal, heterosulcoid. **Colliculum:** Homomorph, indistinct anterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Very elongate, V-shaped. **Cauda:** Short, narrow, slightly flared posteriorly. **Ostio-caudal differentiation:** Slight dorso-ventral constrictions. **Ostium/cauda:** 1:0.5, 1:0.4, 1:0.2. **Collum:** Low and broad. **Crista superior:** Narrow ridge over ostium, well developed over cauda. **Crista inferior:** Narrow, low ridge under ostium, high ridge under collum, well developed under cauda. **Dorsal depression:** Elongate, dorsal area reduced. **Ventral depression:** Elongate and narrow, ventral area very reduced. **Rostrum:** Elongate, tapered and pointed. **Antirostrum:** Elongate, tapered and pointed. **Excisura:** Wide, notch deep, angle acute.

### MACRORHAMPHOSIDAE Nelson No. 256

**Family characteristics:** Otolith hour-glass shaped up to c. 1.4 mm OD, heterosulcoid with ostio-caudal openings. Homomorph with anterior colliculum but structure complex. Otoliths reminiscent of Zeidae.

#### Key

- 1a. Anterior colliculum bulging . . . . .  
. . . . . *Macroramphosus scolopax* 147.2
- 1b. Anterior colliculum depressed and reduced  
. . . . . *Notopogon macrosolen* 147.4

#### *Macroramphosus scolopax*, SSF No. 147.2 PLATE 47

**DISTRIBUTION:** Worldwide in tropical/subtropical waters; locally from Table Bay to Durban. Attains 19 cm.

**MATERIAL:** 2/35 (1.2, 1.25 mm OD, 120, 137 mm TL), PEM 12860 (RUSI 28336), 12857 (RUSI 28337), [12678 (RUSI 34090)]; Mozambique; Id. MJS, PCH.

**Otolith shape:** Hour-glass. **Thickness:** Moderately thin. **Form:** - Mesial irregular, - Lateral approximately flat. **Dorsal margin:** Domed, narrow and rounded; **sculpture,** entire. **Ventral margin:** Slightly rounded, notched posteriorly and irregular. **Posterior margin:** Emarginate and approximately entire. **Sulcus acusticus:** Ostio-caudal, heterosulcoid. **Colliculum:** Homomorph, single raised anterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Flared anteriorly, filled by protruding colliculum. **Cauda:** Narrow, U-shaped in cross section. **Ostio-caudal differentiation:** Slight dorsal constriction. **Ostium/cauda:** 1:1.5, 1:1.3. **Collum:** Absent, slight step up to cauda. **Crista superior:** Well developed, indistinct posteriorly. **Crista inferior:** Well developed, rounded and bulged, absent under anterior ostium. **Dorsal depression:** Above crista, may be deep. **Ventral depression:** Absent, area flattened. **Rostrum:** Large, broad and rounded. **Antirostrum:** Short, broad and rounded. **Excisura:** Moderate, notch shallow, angle wide.

#### *Notopogon macrosolen*, SSF No. 147.4 PLATE 47

**DISTRIBUTION:** Northwest of Cape Town to Saldanha Bay. Attains 33 cm.

**MATERIAL:** 4/13 (0.75-1.4 mm OD, 53-228 mm SL), PEM 12066, 12065, 11103, 11105; Cape west coast; Id. PC.

**Otolith shape:** Hour-glass. **Thickness:** Moderately thin. **Form:** - Mesial irregular, - Lateral approximately flat. **Dorsal margin:** Domed, narrow and rounded; **sculpture**, entire. **Ventral margin:** Slightly rounded, notched towards posterior and irregular. **Posterior margin:** Emarginate and approximately entire. **Sulcus acusticus:** Ostio-caudal, heterosulcoid. **Colliculum:** Homomorph, small, low colliculum in front of ostium. **Pseudocolliculum:** Absent. **Ostium:** Deep posteriorly, colliculum bulges anteriorly. **Cauda:** Narrow and U-shaped in cross section. **Ostio-caudal differentiation:** Not constricted. **Ostium/cauda:** 1:1.7, 1:1.5, 1:1.1, 1:1. **Collum:** Absent, but step up to cauda. **Crista superior:** Well developed and rounded. **Crista inferior:** Well developed and bulged. **Dorsal depression:** Shallow above crista. **Ventral depression:** Absent; but area flat and grooved below bulge. **Rostrum:** Large broad and rounded. **Antirostrum:** Short, broad and rounded. **Excisura:** Moderate, notch shallow, angle usually wide.

#### SYNGNATHIDAE Nelson No. 259

**Family characteristics:** Based on single species; otoliths minute (<1 mm OD), approximately discoid. Heterosulcoid with no raised colliculi, opening ostial. Dorsal and ventral depressions joined and horse-shoe shaped.

##### *Trachyrhamphus bicoarctatus*, SSF No. 145.31 PLATE 48

**DISTRIBUTION:** From Durban northwards to Kenya; also northern Red Sea and Arabian Gulf to Mariana Ids. Attains at least 39 cm.

**MATERIAL:** 1/1 (0.4 mm OD, 375 mm TL), PEM 15744; Eilat; Id. PCH.

**Otolith shape:** Approximately discoid. **Thickness:** Thin. **Form:** - Mesial flat, - Lateral slightly convex. **Dorsal margin:** Slightly rounded; **sculpture** approximately entire. **Ventral margin:** Rounded and entire. **Posterior margin:** Flattened and entire. **Sulcus acusticus:** Ostial, heterosulcoid, cristae penetrate excisura. **Colliculum:** No raised colliculi. **Pseudocolliculum:** Absent. **Ostium:** Short, straight and moderately deep. **Cauda:** Short, shallow and rounded. **Ostio-caudal differentiation:** Slight dorso-ventral constrictions. **Ostium/cauda:** 1:1.4. **Collum:** Absent. **Crista superior:** Ridge-like over ostium, poor over cauda. **Crista inferior:** Ridge-like under ostium, poor under cauda. **Dorsal depression:** Deep and horseshoe shaped, continuous with ventral depression. **Rostrum:** Minute and pointed. **Antirostrum:** Minute and sharply rounded. **Excisura:** Moderate, shallow angle acute.

#### ORDER DACTYLOPTERIFORMES

##### DACTYLOPTERIDAE Nelson No. 260

**Family characteristics:** Otoliths may be discoid as juveniles, oval to fusiform with growth. Up to c. 5 mm OD. Heterosulcoid, ostial openings, heteromorph with low or depressed colliculi. Cristae either poorly developed or well developed and ridge-like. Raised area below crista, ventral margin depressed.

##### Key

- 1a. Otolith oval; crista superior well developed; cauda short, oval, very slightly flexed and shallow at tip; colliculi depressed . . . . . *Dactyloptena orientalis* 159.1
- 1b. Otolith discoid (as juvenile) becoming fusiform; crista superior well developed to ridge-like over ostium; cauda elongate, narrow and flexed at tip; colliculi nodular but low . . . . . *Dactyloptena peterseni* 159.2

##### *Dactyloptena orientalis*, SSF No. 159.1 PLATE 48

**DISTRIBUTION:** Port Elizabeth northwards; east to central Pacific. Attains 38 cm.

**MATERIAL:** 3/7 (1.25-1.65 mm OD, 48-61 mm TL), PEM 4270 & 4271 (both RUSI 12782), 0763; off Cape south coast; Id. MJS, PCH.

**Otolith shape:** Oval. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral slightly concave. **Dorsal margin:** Slightly rounded; **sculpture**, irregular. **Ventral margin:** Slightly rounded and irregular. **Posterior margin:** Rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, two depressed colliculi. **Pseudocolliculum:** Absent. **Ostium:** Flares slightly dorsally. **Cauda:** Oval, slightly ventrally flexed. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:0.7, 1:0.9, 1:1.1. **Collum:** Very low, ostium and cauda depressed. **Crista superior:** Well developed anterior ostium to mid-cauda, poor elsewhere. **Crista inferior:** Well developed under neck, absent elsewhere. **Dorsal depression:** Absent or shallow depression. **Ventral depression:** Absent, margin broadly depressed. **Rostrum:** Small and sharply rounded. **Antirostrum:** Small and rounded. **Excisura:** Moderate, notch shallow, angle wide.

##### *Dactyloptena peterseni*, SSF No. 159.2 PLATE 48

**DISTRIBUTION:** East London to Delagoa Bay; also across northern Indian Ocean to Japan. Benthic, adults usually trawled at 50-200 m. Attains c. 30 cm.

**MATERIAL:** 3/3 (1.4-5.0 mm OD, 170-310 mm TL), PEM 7308 (RUSI 28488), 14809 (RUSI 31421), 9331 (RUSI 37491); Natal; Id. MJS, PCH.

**Otolith shape:** Discoid (c. 1.4 mm OD) becoming fusiform (c. 3 mm OD). **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Slightly rounded; **sculpture**, lobed crenate or irregular. **Ventral margin:** Slightly rounded and crenate or irregular. **Posterior margin:** Rounded or sharply rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, two very low, indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Elongate, flared dorsally. **Cauda:** Narrow and flexed ventrally with cauda deepening posteriorly. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:1.2, 1:1, 1:1.2. **Collum:** Absent. **Crista superior:** Well developed to ridge-like over ostium and anterior cauda, poor at tip. **Crista inferior:** Variable, poor or well developed along sulcus. **Dorsal depression:** Small, shallow and oval. **Ventral depression:** Margin depressed under ostium and caudal tip (>2 mm OD). **Rostrum:** Moderate, sharply rounded and blunt. **Antirostrum:** Small and rounded or sharply rounded. **Excisura:** Moderate, notch shallow, angle varies.

#### ORDER SCORPAENIFORMES

##### SCORPAENIDAE Nelson No. 262

**Family characteristics:** A large family with varied otoliths. Otolith shape oval to fusiform. Heterosulcoid with ostial or ostio-caudal openings. Heteromorph, homomorph or lacking raised colliculi.

##### Key

- 1a. Otoliths broad and oval or rounded . . . . . 2
- 1b. Otoliths moderately narrow, elongate oval to oblong . . . . . 5
- 2a. Dorsal margin of otolith well rounded; ventral margin flat or not well rounded; dorsal depression absent or very small . . . . . 3



- 2b. Dorsal and ventral margins of otolith well rounded; dorsal depression relatively large and fan shaped or oval . . . . . 4
- 3a. Otolith rounded-ovate to fusiform; rostrum broad; sulcus opening ostio-caudal; sulcus relatively deep, heterosulcoid and approximately in centre of otolith . . . . . *Taenianotus triacanthus* 149.41
- 3b. Otolith oval to rounded-triangle; rostrum moderate and pointed; sulcus with ostial opening; sulcus deep, heterosulcoid and in lower third of otolith, sulcus angled at about 10° off horizontal . . . . . *Trachyscorpia capensis* 149.44
- 3c. Otolith rounded ovate; rostrum broad and bluntly pointed; sulcus relatively shallow with ostial opening, pseudo-archaesulcoid; colliculi distinct and heteromorph . . . . . *Setarches guentheri* 149.45
- 4a. Anterior and posterior ends of otolith upwardly pointed; ostium indistinct, its dorsal wall flares dorsally; cauda runs diagonally, indistinctly closed at tip; sulcus at about 10° off horizontal . . . . . *Phenacoscorpius adenensis* 149.17
- 4b. Anterior and posterior ends of otolith pointed horizontally; ostium not distinctly flared; cauda straight, caudal tip joins ventral groove . . . . . *Neomerinthe nielsenii* 149.14
- 4c. Anterior end of otolith elongate and pointed horizontally, posterior less pointed and horizontal; ostium elongate and horizontal, slightly flared dorsally; sulcus horizontal in centre of otolith; cauda slightly flexed and deeper at tip . . . . . *Helicolenus dactylopterus* 149.42
- 5a. Cauda not distinctly closed, may be flexed . . . . . 6
- 5b. Cauda distinctly closed . . . . . 7
- 6a. Sulcus horizontal with flexed cauda, indistinctly closed, joins indistinct groove near margin; ostium deep and elongate . . . . . *Sebastapistes strongia* 149.39
- 6b. Sulcus horizontal with caudal tip flexed, indistinctly closed or joining groove to margin; ostium deep, flares slightly dorsally . . . . . *Sebastapistes cyanostigma* 149.37
- 6c. Sulcus angled with caudal tip not closed, joins ventral depression or groove; ostium margins indistinct . . . . . *Pterois antennata* 149.7
- 6d. Sulcus approximately horizontal with cauda indistinctly closed, may join ventral depression at caudal tip; ostium flared dorsally but its dorsal margin indistinct . . . . . *Sebastes capensis* 149.43
- 6e. Sulcus shallow, indistinct and slightly angled with indistinctly closed cauda may join broad ventral groove; ostium poorly defined, flared dorsally . . . . . *Pterois radiata* 149.10
- 7a. Ostium elongate and usually narrow . . . . . 8
- 7b. Ostium short, broad or oval . . . . . 9
- 8a. Otolith narrow and elongate fusiform; rostrum elongate and pointed; cauda elongate, almost reaching posterior margin . . . . . *Scorpaena scrofa* 149.21
- 8b. Otolith approximately oblong to fusiform; rostrum may be pointed; cauda short ending well short of posterior margin . . . . . *Scorpaenopsis venosa* 149.36
- 8c. Otolith oblong; rostrum large and sharply rounded; cauda short and flexed along its length, ending well short of posterior wall . . . . . *Scorpaenopsis gibbosa* 149.32
- 8d. Otolith approximately oblong; rostrum short and pointed; cauda short and deep, slight flexion at tip, ends well short of posterior margin . . . . . *Scorpaenodes parvipinnis* 149.28
- 9a. Otolith oval with blunt posterior margin; distinct anterior colliculum; ostium flared dorsally and ventrally . . . . . *Minous coccineus* 149.3
- 9b. Anterior colliculum oval, may be depressed . . . . . 10
- 10a. Otolith oval; ostium oval, anterior colliculum depressed; dorsal depression shallow, fan-like; cauda short and slightly flexed; crista inferior poorly developed . . . . . *Parapterois heterurus* 149.6
- 10b. Otolith oblong; ostium short and broad, anterior colliculum slightly raised margins, depressed in centre; cauda flares near tip; crista inferior ridge-like and distinct under cauda . . . . . *Synanceia verrucosa* 149.46
- 10c. Otolith oblong, becomes fusiform; ostium flared with large, indistinct colliculum; cauda short; crista inferior poorly developed . . . . . *Pterois miles* 149.8
- 10d. Otolith oval; ostium approximately oval, filled with low colliculum; cauda narrow, slightly flexed and flared at tip; sulcus may appear homosulcoid; crista inferior well developed in neck area only . . . . . *Apistus carinatus* 149.1
- 10e. Otolith oval; ostium slightly flared dorsally; cauda short, slightly flared dorsally; posterior margin of otolith may be notched; dorsal depression oval and shallow; crista inferior poorly developed . . . . . *Dendrochirus brachypterus* 149.4

#### *Apistus carinatus*, SSF No. 149.1 PLATE 48

DISTRIBUTION: Natal northwards; coastal areas of Indo-West Pacific. Attains about 18 cm.

MATERIAL: 1/1 (5.0 mm OD, 82 mm TL), PEM 0408; Durban fish market; Id. GJBR.

**Otolith shape:** Oval. **Thickness:** Moderately thin. **Form:** - **Mesial** slightly convex, - **Lateral** slightly concave. **Dorsal margin:** Slightly rounded; **sculpture**, slightly irregular. **Ventral margin:** Slightly rounded and slightly serrate. **Posterior margin:** Sharply rounded and slightly serrate. **Sulcus acusticus:** Ostial, heterosulcoid, but may appear homosulcoid. **Colliculum:** Homomorph with two extremely low colliculi, may be fused. **Pseudocolliculum:** Absent. **Ostium:** Approximately oval, filled with low colliculum. **Cauda:** Narrower, slightly flexed and flared at posterior, containing small colliculum near tip. **Ostio-caudal differentiation:** Slight dorso-ventral constrictions. **Ostium/cauda:** 1:1.1. **Collum:** Absent. **Crista superior:** Ridge-like in midsection, becoming less developed at extremes. **Crista inferior:** Poorly developed below ostium and caudal tip, well developed in neck area. **Dorsal depression:** Oval and shallow. **Ventral depression:** Absent, shallow ventral groove near margin. **Rostrum:** Short and sharply rounded. **Antirostrum:** Minute and sharply rounded. **Excisura:** Moderate, notch shallow, angle wide.

#### *Minous coccineus*, SSF No. 149.3 PLATE 48

DISTRIBUTION: From Durban northwards; also from Red Sea, Arabian Sea and eastward to Gulf of Thailand. Attains 10 cm.

MATERIAL: 1/1 (2.4 mm OD, 50 mm TL), PEM 0227; off Tugela mouth; Id. GJBR.

**Otolith shape:** Oval. **Thickness:** Moderately thin. **Form:** - **Mesial** slightly convex, - **Lateral** slightly concave. **Dorsal margin:** Rounded; **sculpture**, irregular. **Ventral margin:** Rounded and irregular. **Posterior margin:** Blunt, flattened and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, very low fused colliculi. **Pseudocolliculum:** Absent.



**Ostium:** Short, flared dorsally and ventrally. **Cauda:** Slightly flexed near tip, closed at tip. **Ostio-caudal differentiation:** Slightly constricted dorso-ventrally. **Ostium/cauda:** 1:1.3. **Collum:** Absent. **Crista superior:** Well developed in the anterior and neck, poorly developed towards posterior. **Crista inferior:** Absent under ostium and posterior cauda, poorly developed in neck area. **Dorsal depression:** Shallow and oval above anterior cauda. **Ventral depression:** Absent, groove parallel to ventral margin, penetrates ostial ventral margin. **Rostrum:** Broad, short and sharply rounded. **Antirostrum:** Minute and rounded. **Excisura:** Wide, notch very shallow, angle wide.

***Dendrochirus brachypterus*, SSF No. 149.4 PLATE 48**

**DISTRIBUTION:** From Transkei (32°S) northward to Red Sea and east to central Pacific. Attains about 15 cm.

**MATERIAL:** 4/4 (3.75-5.4 mm OD, 86-130 mm TL), PEM 15389 (RUSI 40575), 1054H, 1289H, 1288H; Bazaruto and Gulf Aqaba; Id. PCH, TH.

**Otolith shape:** Oval. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Rounded; **sculpture**, irregular. **Ventral margin:** Slightly rounded to rounded and irregular to crenate. **Posterior margin:** Sharply rounded to rounded and may be lobed or digitate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Approximately homomorph, depressed colliculi with raised edges. **Pseudocolliculum:** Absent. **Ostium:** Slightly flared dorsally. **Cauda:** Short and approximately straight, sulcus angled ventrally. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:0.6, 1:0.7, 1:0.8, 1:0.8. **Collum:** Absent. **Crista superior:** Well developed (c. 3.8 mm OD) becoming poor (>4.5 mm OD) above anterior ostium, ridge-like over neck, may extend over cauda to tip, well developed at tip. **Crista inferior:** Poor along entire sulcus. **Dorsal depression:** Large and very shallow above crista. **Ventral depression:** Absent, broad groove near margin; may be a ventrally angled groove behind caudal tip. **Rostrum:** Broad and rounded. **Antirostrum:** Small (c. 3.8 mm OD) becoming minute to absent (>4.5 mm OD). **Excisura:** Moderate, notch shallow, angle acute (<4 mm OD) becoming wide.

***Parapterois heterurus*, SSF No. 149.6 PLATE 48**

**DISTRIBUTION:** Natal coast northwards, across Indian Ocean to western Pacific. Attains c. 20 cm.

**MATERIAL:** 1/1 (6.28 mm OD, 220 mm TL), PEM 0240; PEO; Id. GJBR.

**Otolith shape:** Oblong. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Slightly rounded; **sculpture**, irregular to serrate. **Ventral margin:** Rounded and serrate. **Posterior margin:** Blunt and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, oval anterior colliculum and elongate posterior, both depressed in centre. **Pseudocolliculum:** Absent. **Ostium:** Oval, containing colliculum. **Cauda:** Short, narrower and approximately straight or slightly flexed, not open. **Ostio-caudal differentiation:** Slight dorso-ventral constrictions. **Ostium/cauda:** 1:0.9. **Collum:** Absent. **Crista superior:** Poorly developed above the ostium and cauda tip, low ridge over anterior cauda. **Crista inferior:** Poorly developed under ostium and cauda. **Dorsal depression:** Shallow over collum, area grooved. **Ventral depression:** Absent, margin grooved. **Rostrum:** Large, broad and rounded. **Antirostrum:** Small and rounded or irregular. **Excisura:** Wide, notch shallow, angle varies.

***Pterois antennata*, SSF No. 149.7 PLATE 49**

**DISTRIBUTION:** Natal northwards and to central Pacific. Attains c. 20 cm.

**MATERIAL:** 2/2 (3.5, 4.0 mm OD, 77, 110 mm TL), PEM 14520 (RUSI 31368), 15622; Mauritius, Comoro Ids; Id. MJS, PCH.

**Otolith shape:** Oval. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Rounded; **sculpture**, irregular. **Ventral margin:** Rounded and crenate or slightly irregular. **Posterior margin:** Sharply rounded, tip may be down-flexed and lobed. **Sulcus acusticus:** Ostial, may appear ostio-caudal, heterosulcoid, angled. **Colliculum:** Homomorph, single, indistinct anterior. **Pseudocolliculum:** Absent. **Ostium:** Poorly defined, margins approximately parallel. **Cauda:** Short, slightly narrower and tip not closed. **Ostio-caudal differentiation:** Very slight dorso-ventral constrictions. **Ostium/cauda:** 1:0.6, 1:0.8. **Collum:** Absent. **Crista superior:** Very poor over ostium, well developed to low ridge and broad over anterior cauda, poor to absent at tip. **Crista inferior:** Poor under ostium, well developed under cauda. **Dorsal depression:** Shallow and oval above crista. **Ventral depression:** Absent, ventral groove penetrates cauda. **Rostrum:** Large, broad and sharply rounded. **Antirostrum:** Absent. **Excisura:** Moderate, notch absent.

***Pterois miles*, SSF No. 149.8 PLATE 49**

**DISTRIBUTION:** Port Alfred northwards to Red Sea and eastern Indian Ocean. Attains at least 31 cm.

**MATERIAL:** 4/12 (4.3-8.5 mm OD, 241-372 mm TL), PEM 14791 (RUSI 31451), 6593 (RUSI 31617), 14219, 6471; Comoro Ids, Natal, Algoa Bay and PEO; Id. MJS, PCH.

**Otolith shape:** Oblong, becoming fusiform but highly variable, may have deeply notched anterior and posterior margins. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Rounded; **sculpture**, very irregular. **Ventral margin:** Rounded to flattened, very irregular and variable, lobed, serrate or digitate. **Posterior margin:** Blunt becoming notched to digitate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, very low colliculi which become depressed in centre with growth. **Pseudocolliculum:** Absent. **Ostium:** Slightly flared with large, indistinct colliculum. **Cauda:** Approximately straight and narrower, dorsal margin flexed slightly, closed at tip. **Ostio-caudal differentiation:** Slight dorso-ventral constrictions. **Ostium/cauda:** 1:1, 1:0.7, 1:0.6, 1:0.8. **Collum:** Absent. **Crista superior:** Well developed along entire sulcus. **Crista inferior:** Poorly developed along sulcus. **Dorsal depression:** Shallow and indistinct. **Ventral depression:** Absent, broad margin groove. Posterior caudal depression present. **Rostrum:** Broad, may be elongate and sharply rounded or blunt. **Antirostrum:** Varies, may be absent to large and rounded. **Excisura:** Moderate, notch varies from absent to deep and angle acute.

***Pterois radiata*, SSF No. 149.10 PLATE 49**

**DISTRIBUTION:** Sodwana Bay northwards and to central Pacific. Attains c. 20 cm.

**MATERIAL:** 3/3 (5.3-6.22 mm OD, 118-175 mm TL), PEM 14261, 1002H, 1290H; Comoro Ids and Gulf of Aqaba; Id. PCH, TH, DF.

**Otolith shape:** Oblong. **Thickness:** Moderately thin. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Rounded; **sculpture**, slightly irregular. **Ventral margin:** Slightly rounded and irregular. **Posterior margin:** Sharply rounded to pointed and irregular. **Sulcus acusticus:** Ostial, heterosulcoid, slightly angled. **Colliculum:** Homomorph, only very low anterior colliculum visible. **Pseudocolliculum:** Absent. **Ostium:** Flared dorsally, oval and poorly defined. **Cauda:** Similar width, approximately straight, poorly defined. **Ostio-caudal differentiation:** Slightly dorsally constricted. **Ostium/cauda:** 1:0.9, 1:1, 1:1.1. **Collum:** Absent. **Crista superior:** Well developed in the neck area, poor to absent elsewhere. **Crista inferior:** Poorly developed to absent



along entire sulcus. **Dorsal depression:** Oval and very shallow. **Ventral depression:** Absent, has broad ventral groove near margin. **Rostrum:** Broad, short and sharply rounded to pointed. **Antirostrum:** Absent or minute. **Excisura:** Narrow, notch absent.

#### *Neomerinthe nielseni*, SSF No. 149.14 PLATE 49

**DISTRIBUTION:** Several specimens trawled off Durban. Attains 14 cm.

**MATERIAL:** 3/3 (6.9-7.5 mm OD, 129-135 mm TL), PEM 14992, 14990, 14991 (all RUSI 35558); off Transkei; Id. MJS, PCH.

**Otolith shape:** Oval. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral flat. **Dorsal margin:** Rounded; sculpture, slightly irregular. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Sharply rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid but poorly defined. **Colliculum:** No raised colliculi visible. **Pseudocolliculum:** Absent. **Ostium:** Slightly wider than cauda, shallow anteriorly. **Cauda:** Straight, tip closure indistinct. **Ostio-caudal differentiation:** Dorsally very slightly constricted. **Ostium/cauda:** 1:1.1, 1:0.9, 1:1.3. **Collum:** Absent. **Crista superior:** Poor over ostium, ridge-like in mid-section, well developed over posterior cauda, absent at tip. **Crista inferior:** Well developed along entire sulcus but poor at extremes. **Dorsal depression:** Fan-shaped and distinct over anterior cauda. **Ventral depression:** Absent, deep, broad groove near margin meets ostium and caudal tip walls. **Rostrum:** Small and rounded. **Antirostrum:** Absent to minute and rounded. **Excisura:** Narrow, notch very shallow, angle wide.

#### *Phenacoscorpius adenensis*, SSF No. 149.17 PLATE 49

**DISTRIBUTION:** A rare deep-water species known from 32°S and near Buffalo River. Attains at least 10 cm.

**MATERIAL:** 4/7 (3.45-4.45 mm OD, 54-79 mm TL), PEM 3499, 3502, 3500, 3504; off Transkei; Id. GJBR, PAH.

**Otolith shape:** Oval, pointed tips. **Thickness:** Moderately thick. **Form:** - Mesial flat, - Lateral slightly convex. **Dorsal margin:** Rounded; sculpture, lobed or irregular. **Ventral margin:** Rounded and sinuate. **Posterior margin:** Rounded or pointed to dorsum, entire. **Sulcus acusticus:** Ostial, may appear mesial, heterosulcoid, indistinct and angled. **Colliculum:** Homosulcoid, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Flares dorsally, very shallow and poorly defined. **Cauda:** Runs diagonally, deeper than ostium, indistinctly closed. **Ostio-caudal differentiation:** Dorsally constricted. **Ostium/cauda:** 1:1.2, 1:1.1, 1:1.2, 1:1.1. **Collum:** Absent. **Crista superior:** Absent over ostium, ridge-like in midsection, poor at tip. **Crista inferior:** Ridge-like in mid-section poor at extremes. **Dorsal depression:** Very shallow and fan-shaped. **Ventral depression:** Absent, may be very shallow groove close to margin. **Rostrum:** Sharply rounded or pointed. **Antirostrum:** Absent. **Excisura:** Wide, notch absent.

#### *Scorpaena scrofa*, SSF No. 149.21 PLATE 49

**DISTRIBUTION:** Algoa Bay to off Natal. South African species thought to be the same as population in Mediterranean and eastern North Atlantic. Attains c. 30cm.

**MATERIAL:** 5/27 (9.6-16.5 mm OD, 204-459 mm TL), PEM 11345 (RUSI 28341), 12468, 12469, 8277, 6779, [15004, 15005, 15006 (all 3 RUSI 35607)]; Natal and Cape south coast; Id. MJS, PCH.

**Otolith shape:** Oblong to fusiform. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Slightly rounded; sculpture, irregular to dentate or serrate. **Ventral margin:** Slightly rounded and irregular, dentate or serrate. **Posterior margin:** Sharply rounded to pointed and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, extremely low colliculi. **Pseudocolliculum:** Ab-

sent. **Ostium:** Approximately horizontal, elongate, narrow, opening along rostrum. **Cauda:** Elongate, slightly narrower, slightly flexed near tip and closed, almost reaching posterior margin. **Ostio-caudal differentiation:** Slight dorso-ventral constrictions. **Ostium/cauda:** 1:0.8, 1:0.9, 1:0.7, 1:0.9, 1:0.8. **Collum:** Absent. **Crista superior:** Ridge-like in neck region, poorly or well developed elsewhere. **Crista inferior:** Well developed under entire sulcus. **Dorsal depression:** In midsection, oval, varies in depth. **Ventral depression:** Absent, groove near margin, may be deep. **Rostrum:** Long and pointed. **Antirostrum:** Absent or small and sharply rounded. **Excisura:** Wide, notch shallow, angle varies.

#### *Scorpaenodes parvipinnis*, SSF No. 149.28 PLATE 50

**DISTRIBUTION:** Durban northwards; throughout Indo-West Pacific. Attains c. 13 cm.

**MATERIAL:** 2/2 (5.1, 5.64 mm OD, 98, 103 mm TL), PEM 14279 (RUSI 30845), 2763; Sodwana Bay and Comoro Ids; Id. GJBR, PCH.

**Otolith shape:** Oblong. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Rounded; sculpture, irregular. **Ventral margin:** Slightly rounded, slightly irregular. **Posterior margin:** Sharply rounded, irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Homomorph, extremely low anterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Approximately oblong and elongate, deepest dorsally. **Cauda:** Short and deep, approximately horizontal but slight ventral flexion at tip, ending well short of posterior margin. **Ostio-caudal differentiation:** Slight dorso-ventral constrictions. **Ostium/cauda:** 1:0.7, 1:0.9. **Collum:** Absent but area between ostium and cauda slightly raised. **Crista superior:** Well developed along mid-sulcus, poorly developed at extremes. **Crista inferior:** Poorly developed along entire sulcus. **Dorsal depression:** Oval in centre. **Ventral depression:** Absent, ventral groove at least the length of sulcus. **Rostrum:** Short and pointed. **Antirostrum:** Absent. **Excisura:** Narrow, notch absent.

#### *Scorpaenopsis gibbosa*, SSF No. 149.32 PLATE 50

**DISTRIBUTION:** Transkei northwards; Indian Ocean and Red Sea. Attains at least 10 cm.

**MATERIAL:** 3/4 (5.06-7.9 mm OD, 138-226 mm TL), PEM 2319, 6650, 2320; ORI; Id. MJS.

**Otolith shape:** Oblong. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Flattened or slightly rounded; sculpture, irregular or lobed. **Ventral margin:** Slightly rounded and very irregular. **Posterior margin:** Sharply rounded irregular to very irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** No raised colliculi visible. **Pseudocolliculum:** Absent. **Ostium:** Elongate, deeper than cauda. **Cauda:** Short, flexed along its length, ending well short of posterior wall, tip closed. **Ostio-caudal differentiation:** Slight dorso-ventral constriction. **Ostium/cauda:** 1:0.9, 1:0.8, 1:1. **Collum:** May be low collum or step up to cauda. **Crista superior:** Poor over ostium, well developed becoming ridge-like and uneven over cauda with growth. **Crista inferior:** Poor under ostium, well developed under cauda. **Dorsal depression:** Oblong and shallow. **Ventral depression:** Absent, ventral groove near margin in large otoliths. **Rostrum:** Large and sharply rounded. **Antirostrum:** Minute and rounded or absent. **Excisura:** Moderate, notch very shallow and wide.

#### *Scorpaenopsis venosa*, SSF No. 149.36 PLATE 50

**DISTRIBUTION:** Durban northwards and scattered localities in Indo-Pacific. Attains 18 cm.

**MATERIAL:** 3/6 (4.5-7.1 mm OD, 95-173 mm TL), PEM 8432, 8162 (RUSI 34059), 6739; off Durban and Kosi Bay; Id. MJS, PCH.



**Otolith shape:** Oblong. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Slightly rounded; **sculpture,** slightly irregular to very irregular with growth (c. 7 mm OD). **Ventral margin:** Slightly rounded and slightly irregular to very irregular with growth. **Posterior margin:** Sharply rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Homomorph, indistinct, depressed anterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Elongate, narrow, extends along rostrum. **Cauda:** Straight, ventrally flexed at tip, closed, ending well short of posterior margin. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:0.8, 1:0.8, 1:0.8. **Collum:** Step up to cauda. **Crista superior:** Well developed to low uneven ridge over cauda and posterior ostium, very poor over extremes. **Crista inferior:** Absent under anterior ostium, well developed elsewhere. **Dorsal depression:** Small and shallow above crista. **Ventral depression:** Absent, shallow groove close to margin. **Rostrum:** Large and pointed. **Antirostrum:** Small and rounded. **Excisura:** Wide, notch absent, deepening with growth, angle wide.

***Sebastapistes cyanostigma*, SSF No. 149.37 PLATE 50**

**DISTRIBUTION:** Port Alfred northwards to Red Sea and east to central Pacific. Attains c. 7 cm.

**MATERIAL:** 2/3 (3.0, 3.4 mm OD, 59, 62 mm TL), PEM 2764, 14272 (RUSI 31116); Comoro Ids and Sodwana; Id. PCH, MMS.

**Otolith shape:** Oval. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral slightly concave. **Dorsal margin:** Rounded; **sculpture,** irregular. **Ventral margin:** Slightly rounded and slightly irregular with notch under caudal tip. **Posterior margin:** Blunt or sharply rounded and irregular. **Sulcus acusticus:** Ostial (may appear ostio-caudal), heterosulcoid. **Colliculum:** No raised colliculi. **Pseudocolliculum:** Absent. **Ostium:** Slightly flared dorsally, deeper than cauda. **Cauda:** Slight ventral flexion, ends near margin notch, indistinctly closed. **Ostio-caudal differentiation:** Slight dorso-ventral constrictions. **Ostium/cauda:** 1:1.1, 1:1.1. **Collum:** Absent, step up to cauda. **Crista superior:** Well developed except at tip. **Crista inferior:** Well developed, poor at extremes. **Dorsal depression:** Shallow and oblong. **Ventral depression:** Absent, shallow and indistinct ventral groove and post-caudal trough to margin. **Rostrum:** Broad and sharply rounded. **Antirostrum:** Small and pointed or rounded. **Excisura:** Moderate, notch shallow, angle varies.

***Sebastapistes strongia*, SSF No. 149.39 PLATE 50**

**DISTRIBUTION:** Transkei northwards; widespread in Indo-Pacific. Attains c. 6 cm.

**MATERIAL:** 1/1 (2.5 mm OD, 42 mm TL), PEM 8414 (RUSI 34118); Kosi Bay; Id. PCH.

**Otolith shape:** Oval to oblong. **Thickness:** Moderately thin. **Form:** - Mesial convex, - Lateral slightly concave. **Dorsal margin:** Slightly rounded; **sculpture,** irregular. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Bluntly rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** No raised colliculi, floor of ostium depressed. **Pseudocolliculum:** Absent. **Ostium:** Deep and V-shaped, elongate, slightly flared. **Cauda:** Straight, slightly flexed and poorly defined at tip. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:0.9. **Collum:** Absent, step up to cauda. **Crista superior:** Ridge-like from mid-ostium to flexion, poor at extremes. **Crista inferior:** Well developed in mid-section, poor at extremes. **Dorsal depression:** Shallow above crista. **Ventral depression:** Absent, indistinct groove near margin. **Rostrum:** Moderate and sharply rounded. **Antirostrum:** Minute and rounded. **Excisura:** Moderate, notch shallow, angle wide.

***Taenianotus triacanthus*, SSF No. 149.41 PLATE 50**

**DISTRIBUTION:** Durban northwards and to central Pacific. Attains c. 10 cm.

**MATERIAL:** 1/1 (3.3 mm OD, 90 mm TL), PEM 14578 (RUSI 31442); Mauritius; Id. MJS, PCH.

**Otolith shape:** Rounded-ovate to fusiform. **Otolith thickness:** Moderately thick. **Form:** - Mesial slightly convex, - Lateral flat. **Dorsal margin:** Well rounded; **sculpture,** slightly irregular. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Bluntly rounded, notched and irregular. **Sulcus acusticus:** Ostio-caudal, heterosulcoid. **Colliculum:** Homomorph, indistinct, low anterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Deep, extends into rostrum. **Cauda:** Deeper, flares before narrowing to margin opening. **Ostio-caudal differentiation:** Slight dorso-ventral constrictions. **Ostium/cauda:** 1:1.2. **Collum:** Distinct, to half height of cristae. **Crista superior:** Well developed over neck and anterior cauda, absent at tip. **Crista inferior:** Narrow ridge under ostium, broader under cauda. **Dorsal depression:** Small and shallow behind antirostrum. **Ventral depression:** Absent, area uneven, papilliform. **Rostrum:** Large, blunt and rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Large, notch shallow, angle wide.

***Helicolenus dactylopterus*, SSF No. 149.42 PLATE 50**

**DISTRIBUTION:** Walvis Bay to Natal; also throughout Atlantic, although subspecies recognised. Attains at least 31 cm.

**MATERIAL:** 6/240 (6.0-14.8 mm OD, 130-430 mm TL), PEM 11379, 14583 (RUSI 31383), 7812 (RUSI 28340), 7811 (RUSI 28339), 12069, 12067; Cape south and west coasts; Id. MJS, PCH.

**Otolith shape:** Oval to rounded fusiform. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral flat. **Dorsal margin:** Rounded; **sculpture,** irregular lobes. **Ventral margin:** Rounded and irregular. **Posterior margin:** Bluntly or sharply rounded and irregularly lobed. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Homomorph, very indistinct anterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Elongate and horizontal, flared dorsally, floor raised below antirostrum. **Cauda:** Horizontal, slight ventral flexion at tip, deeper at posterior. **Ostio-caudal differentiation:** Slight ventral constriction. **Ostium/cauda:** 1:0.8, 1:1.1, 1:1.1, 1:1, 1:0.8, 1:0.9. **Collum:** Absent, slight step to cauda. **Crista superior:** Ridge-like along length of sulcus, very poor over extremes. **Crista inferior:** Well developed under cauda, poor under ostium. **Dorsal depression:** Large, oval and distinct. **Ventral depression:** Absent. **Rostrum:** Moderate, broad and sharply rounded. **Antirostrum:** Small and rounded or absent. **Excisura:** Moderate, notch shallow, angle wide.

***Sebastes capensis*, SSF No. 149.43 PLATE 50**

**DISTRIBUTION:** From Cape to Saldanha Bay. Also occurs at Gough and Tristan da Cunha islands and possibly off southern and western South America. Attains at least 37 cm.

**MATERIAL:** 2/3 (9.9, 12.5 mm OD, 179, 238 mm SL), PEM 12090, 12119; Cape west coast; Id. PC.

**Otolith shape:** Oblong. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Rounded; **sculpture,** slightly irregular. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Blunt and irregular. **Sulcus acusticus:** Ostial, heterosulcoid, may be angled. **Colliculum:** No raised colliculi. **Pseudocolliculum:** Absent. **Ostium:** Ventral margin horizontal, flared dorsally, deeper posteriorly. **Cauda:** Horizontal, straight with rounded tip, indistinctly closed. **Ostio-caudal differentiation:** Slight ventral constriction. **Ostium/cauda:** 1:1.1, 1:1.1. **Collum:** Absent, slight step to cauda. **Crista superior:** Ridge-like over cauda and post-



erior ostium, poor at extremes. **Crista inferior:** Well developed under cauda, poor under ostium. **Dorsal depression:** Large, oval and shallow. **Ventral depression:** Absent, broad, very shallow groove near margin. **Rostrum:** Large, broad and pointed. **Antirostrum:** Small or minute, rounded. **Excisura:** Moderate, notch shallow, angle acute.

***Trachyscorpia capensis*, SSF No. 149.44 PLATE 51**

**DISTRIBUTION:** Cape to St Helena Bay, the same or similar species in southern Australia. Attains c. 35 cm.

**MATERIAL:** 3/50 (9.6-14.5 mm OD, 190-347 mm TL), PEM 14070, 14075, 14071; Cape west coast; Id. PAH, GJBR, lodged in SAM.

**Otolith shape:** Oval to rounded-triangular. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Rounded to raised; sculpture, irregular. **Ventral margin:** Slightly rounded and slightly irregular to very irregular anteriorly. **Posterior margin:** Pointed and irregular. **Sulcus acusticus:** Ostial, heterosulcoid, in lower third of otolith, may be angled. **Colliculum:** No raised colliculi. **Pseudocolliculum:** Absent. **Ostium:** Shallow, becoming deep with growth, angled at 10-20°. **Cauda:** Square tip, becoming very deep with growth. **Ostio-caudal differentiation:** Slight dorsal constriction. **Ostium/cauda:** 1:0.7, 1:0.5, 1:0.9. **Collum:** Absent. **Crista superior:** Ridge-like along the entire sulcus; in small otoliths (c. 12 mm), well developed. **Crista inferior:** High ridge under cauda (cup-like), ridge-like under ostium; poorly developed in small otoliths (c. 12 mm OD). **Dorsal depression:** Absent. **Ventral depression:** Absent, area rough. **Rostrum:** Moderate, pointed and irregular. **Antirostrum:** Small to absent. **Excisura:** Moderate, notch absent.

***Setarches guentheri*, SSF No. 149.45 PLATE 51**

**DISTRIBUTION:** Occurs nearly worldwide in warm seas. Attains 23 cm.

**MATERIAL:** 4/5 (4.8-10.12 mm OD, 97-208 mm TL), PEM 15029 (RUSI 35526), 5020, 5021 & 5019 (all 3 RUSI 13998); Kenya and Cape south coast; Id. PCH, MJS.

**Otolith shape:** Rounded ovate. **Thickness:** Moderately thin. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Rounded, raised; sculpture, lobed. **Ventral margin:** Slightly rounded and irregular. **Posterior margin:** Sharply rounded and irregular. **Sulcus acusticus:** Ostial, pseudo-archaesulcoid (differentiated only by colliculi). **Colliculum:** Heteromorph, anterior large and oval, posterior small and round, may be fused. **Pseudocolliculum:** Absent. **Ostium and cauda:** Differentiated only by colliculi, sulcus shallow. **Ostio-caudal differentiation:** No constrictions. **Ostium/cauda:** 1:0.7, 1:0.9, 1:0.8, 1:1. **Collum:** Absent. **Crista superior:** Absent. **Crista inferior:** Poorly developed anteriorly, low ridge posteriorly. **Dorsal depression:** Absent. **Ventral depression:** Absent. **Rostrum:** Broad and bluntly pointed. **Antirostrum:** Variable - small to large and pointed. **Excisura:** Moderate, notch moderate, angle varies.

***Synanceia verrucosa*, SSF No. 149.46 PLATE 51**

**DISTRIBUTION:** Red Sea and tropical Indo-Pacific, south to Durban. Attains 35 cm.

**MATERIAL:** 3/10 (5.0-8.9 mm OD, 150-325 mm TL), PEM 9641 (RUSI 37495), 14568, 14566; Mauritius and ORI; Id. MJS, PCH.

**Otolith shape:** Oblong. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral concave. **Dorsal margin:** Slightly rounded; sculpture, irregular to digitate. **Ventral margin:** Slightly rounded and irregular. **Posterior margin:** Blunt or sharply rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Homomorph with a low anterior colliculum, depressed in centre. **Pseudocolliculum:** Absent. **Ostium:** Short

and broad, deeper than cauda, slightly flared. **Cauda:** Approximately horizontal, slight flare and flexion at closed tip. **Ostio-caudal differentiation:** Slight dorso-ventral constriction. **Ostium/cauda:** 1:0.8, 1:1, 1:1. **Collum:** Absent, step up to cauda. **Crista superior:** Poor over ostium, well developed over cauda, poor at tip. **Crista inferior:** Poorly developed under ostium, ridge-like to crested under anterior cauda, well developed posteriorly. **Dorsal depression:** Absent. **Ventral depression:** Shallow depression under crista. **Rostrum:** Short, broad and sharply rounded. **Antirostrum:** Absent. **Excisura:** Moderate, notch absent.

**SCORPAENIDAE Nelson No 262  
(TETRAROGIDAE in SSF)**

**Family characteristics:** Only one species available. Otolith oval, small (< 2 mm OD), pseudo-archaesulcoid with ostial opening, colliculi extremely indistinct.

***Coccotropsis gymnoderma*, SSF No. 150.2 PLATE 51**

**DISTRIBUTION:** Taken from the Cape to Algoa Bay. Attains 40 mm.

**MATERIAL:** 7/26 (0.85-1.95 mm OD, 20-43 mm TL), PEM 5366, 4199 (RUSI 12781), 5636, 5637, 5220, 4639, 5218, [4198 (RUSI 12789)]; Cape south coast; Id. MJS, PCH.

**Otolith shape:** Oval. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral flat. **Dorsal margin:** Slightly rounded; sculpture, slightly irregular. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Slightly square or rounded and irregular. **Sulcus acusticus:** Ostial, pseudo-archaesulcoid. **Colliculum:** Heteromorph, extremely indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Ventral margin horizontal, flared slightly dorsally, deeper than cauda. **Cauda:** Horizontal, poorly defined dorsally. **Ostio-caudal differentiation:** Absent. **Ostium/cauda:** 1:1.1, rest 1:0.9. **Collum:** Low, half way up cristae. **Crista superior:** Very poorly developed along entire sulcus. **Crista inferior:** Moderately well developed, poor at tip. **Dorsal depression:** Absent. **Ventral depression:** Absent, may be a shallow groove near margin. **Rostrum:** Small and sharply rounded. **Antirostrum:** Small and rounded. **Excisura:** Moderate, notch very shallow, angle wide.

**CONGIPODIDAE Nelson No. 267**

**Family characteristics:** Oblong, up to 5.8 mm OD. Heterosulcoid, with ostial openings and cauda which ends very close to posterior margin. Low heteromorph colliculi generally indistinct. Dorsal area fan-shaped, from sulcus to margin. Ventral area reduced.

**Key**

- 1a. Sulcus deep; crista superior ridge-like over ostium; ventral area reduced; crista inferior ridge-like along sulcus . . . . . *Congiopodus spinifer* 152.1
- 1b. Sulcus moderately deep; crista superior poorly developed over ostium; ventral area depressed and shelf-like; crista inferior well developed along sulcus but ridge-like under collum . . . *Congiopodus torvus* 152.2

***Congiopodus spinifer*, SSF No. 152.1 PLATE 51**

**DISTRIBUTION:** Taken from Walvis Bay to Natal. Attains 35 cm.

**MATERIAL:** 5/50 (3.3-4.9 mm OD, 176-288 mm TL), PEM 12679 (RUSI 28352), 12665, 12224, 12223, 12327; Cape south and west coasts; Id. MJS, PCH.

**Otolith shape:** Approximately oblong. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral flat. **Lateral surface:** Depressed nucleus near ventral margin. **Dorsal margin:** Approximately flat; sculpture, lobed or irregular. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:**



Oblique and sharply rounded, slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, extremely low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Elongate, ventral margin horizontal, dorsally flared. **Cauda:** Oval, slightly depressed. Ventral wall straight, lies close to posterior margin. **Ostio-caudal differentiation:** Dorsally constricted. **Ostium/cauda:** 1:0.6, 1:0.6, 1:0.6, 1:0.7, 1:0.6. **Collum:** Low and wide. **Crista superior:** Poorly developed over ostium, absent over cauda. **Crista inferior:** Ridge-like under collum, well developed elsewhere. **Dorsal depression:** Absent, fan-shaped dorsal area over collum. **Ventral depression:** Absent, post-caudal depressed notch, ventral area reduced. **Rostrum:** Large and broad, pointed or sharply rounded. **Antirostrum:** Small and rounded or absent. **Excisura:** Moderate, notch shallow, angle wide.

#### *Congiopodus torvus*, SSF No. 152.2 PLATE 52

**DISTRIBUTION:** Taken from Namibia to Pondoland (Transkei). Attains 76 cm.

**MATERIAL:** 4/5 (4.5-5.8 mm OD, 390-512 mm TL), PEM 2241, 2242, 1145, 12178; Cape south coast; Id. MJS, PCH.

**Otolith shape:** Oblong. **Thickness:** Moderate, becoming thicker with growth. **Form:** - Mesial slightly convex, - Lateral flat. **Lateral surface:** Nucleus raised near dorsal margin. **Dorsal margin:** Slightly rounded; **sculpture,** irregular. **Ventral margin:** Approximately flat and lobed to irregular. **Posterior margin:** Sharply rounded, notched with a point. **Sulcus acusticus:** Ostial, may appear ostio-caudal, heterosulcoid. **Colliculum:** Heteromorph, very low and indistinct. **Pseudocolliculum:** Absent. **Ostium:** Ventral wall approximately horizontal, flared dorsal wall, larger and deeper than cauda. **Cauda:** May appear open, close to posterior margin, approximately oval in shape. **Ostio-caudal differentiation:** Dorsally constricted. **Ostium/cauda:** 1:0.7, 1:0.6, 1:0.6, 1:0.9. **Collum:** Low, may be broad. **Crista superior:** Ridge-like over ostium, absent over cauda. **Crista inferior:** Ridge-like except at caudal tip, may become crystalline with growth. **Dorsal depression:** Absent, fan-shaped, grooved dorsal area over collum becoming more uneven with growth. **Ventral depression:** Depression under crista, margin like depressed shelf with growth. Ventral area reduced. **Rostrum:** Small and pointed. **Antirostrum:** Absent or small and pointed. **Excisura:** Moderate, notch varies, angle acute.

#### TRIGLIDAE Nelson No. 268

**Family characteristics:** Otoliths approximately ovate or oval with sharp ends, up to c. 7.5 mm OD. Dorsal margins raised and rounded. Heterosulcoid with ostial openings but there may be groove from margin to cauda, which ends very close to margin. Ostium and cauda often deep, usually separated by rounded collum. Heteromorph, indistinct, depressed colliculi.

##### Key

- 1a. Excisural notch very shallow; dorsal margins rounded but not raised . . . . . 2
- 1b. Excisural notch distinct and usually deep; dorsal margin generally raised and angular or rounded . . . . . 3
- 2a. Dorsal depression distinct, becoming deep; anterior colliculum flat and protrudes through excisura; posterior margin sharply rounded with notch behind cauda . . . . . *Lepidotrigla multispinosa* 157.5
- 2b. Dorsal depression shallow; colliculi indistinct and depressed; posterior margin with extended, ventrally flexed corner . . . . . *Lepidotrigla faurei* 157.4
- 3a. Crista superior horizontal; caudal tip flared ventrally only . . . . . *Trigla lyra* 157.6
- 3b. Crista superior sinuous, upwardly flexed after neck; caudal tip flared dorsally and ventrally . . . . . 4

- 4a. Posterior sulcus narrow, not distinctly flared at caudal tip; no pit in cauda; cauda usually ends distinctly short of posterior margin; posterior margin oblique and straight with pointed ventral corner (without notch) . . . *Chelidonichthys kumu* 157.2
- 4b. Posterior sulcus wide and flared at caudal tip; deep pit in caudal tip; cauda usually ends very close to posterior margin; posterior margin either slightly rounded or notched if oblique, corner not pointed unless with notch . . . . . 5
- 5a. Excisural notch distinct but usually shallow, angle wide; dorsal margin raised and angular; crista superior developed as a low, uneven ridge to mid-cauda . . . *Trigloporus lastoviza africanus* 157.7
- 5b. Excisural notch deep and wide, angle acute; dorsal margin raised and rounded; crista superior ridge-like and unbroken along entire sulcus . . . . . 6
- 6a. Rostrum usually larger than antirostrum, usually more produced and sharper than *C. queketti*; posterior margin of otolith notched . . . *Chelidonichthys capensis* 157.1
- 6b. Rostrum and antirostrum approximately equal size, rostrum usually appear more blunt than *C. capensis*; posterior margin of otolith not notched . . . . . *Chelidonichthys queketti* 157.3

#### *Chelidonichthys capensis*, SSF No. 157.1 PLATE 52

**DISTRIBUTION:** Known only from Cape Frio (Namibia) to Maputo. Attains 70 cm.

**MATERIAL:** 6/11 (2.55-7.4 mm OD, 161-605 mm TL), PEM 12120, 3035, 7017 (RUSI 34096), 11669, 12766, 12743; Cape south and west coasts; Id. MJS, PCH.

**Otolith shape:** Bluntly ovate. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Rounded, raised posteriorly; **sculpture,** crenate or irregular. **Ventral margin:** Slightly rounded and crenate or irregular. **Posterior margin:** Oblique, crenate with pointed postero-ventral corner. **Sulcus acusticus:** Ostial, but may be a groove penetrating cauda in large otoliths, heterosulcoid. **Colliculum:** Heteromorph, extremely indistinct, depressed colliculi. **Pseudocolliculum:** Absent. **Ostium:** Flares, slightly deeper than cauda. **Cauda:** Approximately oval, tip flared, round and deep, ends near margin, may have margin groove to it. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:1.1, 1:0.9, 1:1.1, 1:0.8, 1:0.7, 1:1.1. **Collum:** Rounded, slightly raised to approximately half crista height. **Crista superior:** Ridge-like along entire sulcus. **Crista inferior:** Poorly developed under anterior ostium, well developed along cauda. **Dorsal depression:** Deep and oval above crista. **Ventral depression:** Absent, may have shallow ventral groove near margin. **Rostrum:** Large, broad and sharply rounded. **Antirostrum:** Large, broad and sharply rounded. **Excisura:** Moderate, notch deep, angle acute.

#### *Chelidonichthys kumu*, SSF No. 157.2 PLATE 52

**DISTRIBUTION:** Indo-west Pacific, common in Australia and New Zealand. Also reported from Korea and Japan; in our area from the Cape to Delagoa Bay. Attains 60 cm.

**MATERIAL:** 4/30 (2.45-5.1 mm OD, 136-300 mm TL), PEM 4568, 11680, 12940 (RUSI 34171), 14415, [7682 (RUSI 34085)]; Cape south coast and Mozambique; Id. MJS, PCH.

**Otolith shape:** Bluntly ovate. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Raised and rounded; **sculpture,** crenate or irregular. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Oblique and approximately straight, crenate or irregular with postero-ventral corner extended. **Sulcus acusticus:**



Ostial, heterosulcoid and sinuate in shape. **Colliculum:** Heteromorph, extremely indistinct, depressed colliculi. **Pseudocolliculum:** Absent. **Ostium:** Slightly smaller, but same depth as cauda; neck narrow. **Cauda:** Fairly narrow, usually no deep pit at tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:0.9, 1:0.6, 1:0.7, 1:0.6. **Collum:** Slightly raised and rounded area in neck. **Crista superior:** Ridge-like over neck, well developed elsewhere. **Crista inferior:** Poor under ostium, well developed elsewhere. **Dorsal depression:** Shallow and oval. **Ventral depression:** Absent. **Rostrum:** Short and sharply rounded. **Antirostrum:** Short and pointed. **Excisura:** Moderate, notch shallow, angle acute.

***Chelidonichthys queketti*, SSF No. 157.3 PLATE 52**

**DISTRIBUTION:** Table Bay to Natal. Attains 35 cm.

**MATERIAL:** 5/80 (3.3-4.9 mm OD, 233-302 mm TL), PEM 12754, 3285 (RUSI 11641), 3283 (RUSI 11641), 12761, 12753; Cape south coast; Id. MJS, PCH.

**Otolith shape:** Bluntly ovate. **Thickness:** Moderately thick. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Rounded; sculpture, crenate. **Ventral margin:** Rounded and crenate. **Posterior margin:** Oblique or rounded and crenate or dentate. **Sulcus acusticus:** Ostial, but may appear ostio-caudal, with grooves from margin, heterosulcoid. **Colliculum:** Heteromorph, indistinct and depressed colliculi. **Pseudocolliculum:** Absent. **Ostium:** Small, extending onto rostrum. **Cauda:** Oval, deep and wide. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.3, 1:1.6, 1:1.3, 1:1.4, 1:1.5. **Collum:** Slightly raised and rounded. **Crista superior:** Ridge-like along sulcus, poor at tip. **Crista inferior:** Well developed in neck, very poor at extremes. **Dorsal depression:** Oval above crista. **Ventral depression:** Absent, may be a shallow groove from margin to cauda. **Rostrum:** Large and sharply rounded. **Antirostrum:** Large, broad and sharply rounded. **Excisura:** Moderate, notch deep, angle acute.

***Lepidotrigla faurei*, SSF No. 157.4 PLATE 52**

**DISTRIBUTION:** Durban northwards to India. Attains 18 cm.

**MATERIAL:** 1/1 (4.0 mm OD, 161 mm TL), PEM 0456; off Durban; Id. GJBR.

**Otolith shape:** Oval with sharp ends. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Rounded; sculpture, crenate. **Ventral margin:** Rounded and crenate. **Posterior margin:** Pointed and irregular. **Sulcus acusticus:** Ostial, heterosulcoid, sinuous-shaped sulcus. **Colliculum:** Heteromorph, indistinct, depressed colliculi. **Pseudocolliculum:** Absent. **Ostium:** Elongate, colliculum penetrates excisura. **Cauda:** Similar width to ostium, slightly deeper and rounded tip. **Ostio-caudal differentiation:** Slight dorso-ventral constrictions. **Ostium/cauda:** 1:1.3. **Collum:** Very low and rounded. **Crista superior:** Ridge-like, poorly developed at extremes. **Crista inferior:** Well developed at neck, poor at extremes. **Dorsal depression:** Oval above crista. **Ventral depression:** Absent, but shallow groove parallel to margin. **Rostrum:** Small and rounded. **Antirostrum:** Minute and rounded to absent. **Excisura:** Moderate, notch very shallow, angle wide.

***Lepidotrigla multispinosa*, SSF No. 157.5 PLATE 52**

**DISTRIBUTION:** Natal, Kenya and Mozambique. Attains 16 cm.

**MATERIAL:** 5/13 (3.4-5.1 mm OD, 110-160 mm TL), PEM 12992, 12863, 12991 (RUSI 28349), 12988 (RUSI 28350), 12994, [12864 (RUSI 28520), 14974 (RUSI 35527)]; Mozambique; Id. MJS, PCH.

**Otolith shape:** Approximately oval, may be pointed. **Thickness:** Moderately thin. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Rounded; sculpture, crenate or irregular. Ven-

tral margin: Rounded and crenate. **Posterior margin:** Sharply rounded with notch behind cauda, and crenate. **Sulcus acusticus:** Ostial, heterosulcoid, sulcus slightly sinuate. **Colliculum:** Heteromorph, low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Elongate with flat protruding colliculum. **Cauda:** Deeper than ostium and rounded tip, may have shallow groove to dorsal margin. **Ostio-caudal differentiation:** Dorso-ventrally slightly constricted. **Ostium/cauda:** 1:1.4, 1:1.8, 1:1.8, 1:1.2, 1:1.1. **Collum:** Absent. **Crista superior:** Ridge-like, poor at extremes. **Crista inferior:** Well developed in neck, poorly developed elsewhere. **Dorsal depression:** Oval, may be deep. **Ventral depression:** Absent, a ventral groove may be present near margin. **Rostrum:** Small and sharply rounded. **Antirostrum:** Very small and sharply rounded. **Excisura:** Moderate, notch shallow, angle wide.

***Trigla lyra*, SSF No. 157.6 PLATE 53**

**DISTRIBUTION:** A common eastern Atlantic and Mediterranean, its southern limit appears to be Walvis Bay. Attains at least 47 cm, perhaps 60 cm.

**MATERIAL:** 1/1 (5.6 mm OD, 460 mm SL), 0283H; locality unknown; Id. AK.

**Otolith shape:** Oval with sharp ends. **Thickness:** Moderately thin. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Raised and rounded; sculpture, irregular. **Ventral margin:** Rounded and irregular or dentate. **Posterior margin:** Rounded or oblique, irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, indistinct depressed colliculi. **Pseudocolliculum:** Absent. **Ostium:** Slightly flared, approximately same depth as cauda. **Cauda:** Straight dorsal margin, tip not as rounded as previous spp. **Ostio-caudal differentiation:** Slight dorso-ventral constriction. **Ostium/cauda:** 1:0.9. **Collum:** Low, slightly raised area. **Crista superior:** Ridge-like along entire sulcus, poor at tip. **Crista inferior:** Poor under ostium, well developed elsewhere. **Dorsal depression:** Large, oval and deep. **Ventral depression:** Absent, lunate groove in mid-ventral area. **Rostrum:** Small and sharply rounded. **Antirostrum:** Small and pointed. **Excisura:** Moderate, notch shallow, angle wide.

***Trigloporus lastoviza africanus*, SSF No. 157.7 PLATE 53**

**DISTRIBUTION:** Known only from St Sebastian Bay to Port Alfred. Attains 22 cm.

**MATERIAL:** 4/6 (2.0-4.9 mm OD, 77-235 mm TL), PEM 11660 (RUSI 28508), 12463 (RUSI 28347), 15039 (RUSI 35573), 12470 (RUSI 28348); Cape south coast; Id. MJS, PCH.

**Otolith shape:** Oval with sharp ends, blunt ovate in large otoliths. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Rounded or raised; sculpture, crenate or irregular. **Ventral margin:** Slightly rounded and irregular. **Posterior margin:** Oblique, notched and irregular. **Sulcus acusticus:** Ostial, but caudal tip may not be distinctly closed and may have a groove to dorsal margin, heterosulcoid. **Colliculum:** Heteromorph, indistinct, depressed colliculi. **Pseudocolliculum:** Absent. **Ostium:** Flared, notch deepens with growth. **Cauda:** Shallower than ostium, oval in shape at tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.2, 1:1.2, 1:1.5, 1:1.5. **Collum:** Rounded and slightly raised. **Crista superior:** Low, uneven ridge over ostium and anterior cauda, absent at posterior. **Crista inferior:** Absent under ostium, well developed elsewhere. **Dorsal depression:** Shallow and oval above crista. **Ventral depression:** Absent, ventral groove near margin more marked with growth. **Rostrum:** Small to large in bigger otoliths, sharply rounded or pointed. **Antirostrum:** Small, becoming larger with growth and rounded. **Excisura:** Moderate, notch shallow deepening with growth, angle wide to acute.



## TRIGLIDAE Nelson No 268 (PERISTEDIIDAE in SFF)

**Family characteristics:** Otoliths oval to rounded-triangular, heterosulcoid, ostial opening, up to c. 5.3 mm OD. Heteromorph, extremely low colliculi. Cristae well developed to ridge-like at least in neck.

### Key

- 1a. Otolith approximately triangular with rounded corners . . . . . *Satyrichthys investigatoris* 158.3
- 1b. Otolith approximately oval . . . . . 2
- 2a. Cristae distinct along entire sulcus; ostium and cauda deep; raised, rounded area in neck region; colliculi indented but margins slightly raised . . . . . *Satyrichthys adeni* 158.2
- 2b. Cristae distinct in neck region only; ostium and cauda shallow; colliculi often not visible - extremely poorly defined . . . *Peristedion weberi* 158.1

### *Peristedion weberi*, SSF No. 158.1 PLATE 53

**DISTRIBUTION:** Northern Natal to Somalia. Attains 15 cm.

**MATERIAL:** 5/23 (3.2-4.5 mm OD, 131-199 mm TL), PEM 12816, 12825, 12804 (RUSI 28346), 12823, 12803 (RUSI 28345); Mozambique; Id. MJS, PCH.

**Otolith shape:** Oval. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral flat. **Dorsal margin:** Rounded and raised; **sculpture**, slightly crenate. **Ventral margin:** Slightly rounded or flattened and irregular. **Posterior margin:** Sharply rounded and irregular. **Sulcus acusticus:** Small otoliths (c. 3 mm) ostio-caudal. Become ostial with growth and deepening of cauda. Uncoated all may appear ostio-caudal, homosulcoid. **Colliculum:** Homomorph, very indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium and cauda:** Oval, shallow and poorly defined. **Ostio-caudal differentiation:** Slight ventral constriction. **Ostium/cauda:** 1:1, 1:1, 1:1, 1:0.9, 1:0.6. **Collum:** Absent very low raised area in neck. **Crista superior:** Ridge-like over neck, absent elsewhere. **Crista inferior:** Well developed under neck, poorly developed elsewhere. **Dorsal depression:** Oval above crista. **Ventral depression:** Absent, but shallow, wide groove close to margin. **Rostrum:** Small, broad and rounded or sharply rounded. **Antirostrum:** Absent. **Excisura:** Moderate, notch absent or shallow and angle wide.

### *Satyrichthys adeni*, SSF No. 158.2 PLATE 53

**DISTRIBUTION:** Mossel Bay to Delagoa Bay; also known from northern Indian Ocean and Taiwan. Attains 70 cm.

**MATERIAL:** 4/19 (2.5-5.28 mm OD, 112-455 mm TL), PEM 14450 (RUSI 28342), 12941, 14362 (RUSI 28343), 0755, [14447 (RUSI 28344)]; off Algoa Bay and Mozambique; Id. MJS, GJBR, PCH.

**Otolith shape:** Oval. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Rounded; **sculpture**, crenate. **Ventral margin:** Slightly rounded and slightly crenate to irregular. **Posterior margin:** Slightly pointed and crenate to irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, indented colliculi. **Pseudocolliculum:** Absent. **Ostium:** Slightly deeper than cauda, approximately oval. **Cauda:** Approximately same width as ostium, rounded at tip. **Ostio-caudal differentiation:** Dorso-ventrally slightly constricted. **Ostium/cauda:** 1:1.3, 1:1.1, 1:1, 1:1.1. **Collum:** Absent but low rounded rise to cauda. **Crista superior:** Ridge-like along sulcus, poor at extremes. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Oval and well defined. **Ventral depression:** Absent. **Rostrum:** Small and sharply rounded. **Antirostrum:** Absent or very small and rounded. **Excisura:** Moderate, notch absent or shallow, angle wide.

## *Satyrichthys investigatoris*, SSF No. 158.3 PLATE 53

**DISTRIBUTION:** Off Durban, distribution uncertain because of taxonomic confusion. Attains 20 cm.

**MATERIAL:** 3/4 (3.35-4.0 mm OD, 215-237 mm TL), PEM 5023, 5024, 5022 (all RUSI 14096); Kenya; Id. PCH.

**Otolith shape:** Oval to rounded triangle. **Thickness:** Moderately thick. **Form:** - Mesial slightly convex, - Lateral flat. **Dorsal margin:** Domed; **sculpture**, slightly irregular. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Sharply rounded and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, extremely poorly defined posterior colliculum, and low anterior colliculum may be visible. **Pseudocolliculum:** Absent. **Ostium:** Oval and walls poorly defined. **Cauda:** Elongate nearly horizontal. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:1.3, 1:1.4, 1:1.2. **Collum:** Absent, slightly raised rounded area in neck. **Crista superior:** Low ridge, absent at extremes. **Crista inferior:** Well developed under neck, poor to absent elsewhere. **Dorsal depression:** Oval and shallow. **Ventral depression:** Absent. **Rostrum:** Small and rounded. **Antirostrum:** Absent. **Excisura:** Moderate, notch absent.

## PLATYCEPHALIDAE Nelson No. 269 (BEMBRIDAE in SSF)

**Family characteristics:** Only one species. Rounded ovate up to c. 9.2 mm OD, heterosulcoid with ostial opening, cauda may have slight ventral bend. Heteromorph, indistinct colliculi. Otoliths similar to some Scorpaenidae.

### *Parabembras robinsoni*, SSF No. 154.1 PLATE 54

**DISTRIBUTION:** Found only from Durban to southern Mozambique. Attains 24 cm.

**MATERIAL:** 4/4 (8.2-9.2 mm OD, 205-221 mm TL), PEM 11988, 13047 (RUSI 28351), 11987, 11989; Mozambique and Natal; Id. PCH.

**Otolith shape:** Rounded-ovate. **Thickness:** Moderately thick. **Form:** - Mesial slightly convex, - Lateral slightly convex. **Dorsal margin:** Well rounded; **sculpture**, lobed. **Ventral margin:** Slightly rounded and entire. **Posterior margin:** Rounded to sharply rounded and entire. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, very low and indistinct. **Pseudocolliculum:** Absent. **Ostium:** Flared dorsally and elongate, deeper than cauda. **Cauda:** Approximately straight, may have slight ventral bend. **Ostio-caudal differentiation:** Slight dorsal constriction. **Ostium/cauda:** 1:0.7, 1:0.7, 1:0.6, 1:0.7. **Collum:** Absent, low step up to cauda. **Crista superior:** Ridge-like over neck, poor at extremes. **Crista inferior:** Well developed under entire sulcus. **Dorsal depression:** Large, deep and semi-circular above crista. **Ventral depression:** Absent, groove runs from ostium, along margin to near caudal tip. **Rostrum:** Moderate, sharply rounded. **Antirostrum:** Absent. **Excisura:** Moderate, notch very shallow, angle wide.

## PLATYCEPHALIDAE Nelson No. 269

**Family characteristics:** Oblong, up to c. 13 mm OD, heterosulcoid with ostial opening. Heteromorph, low or indistinct colliculi. Ostium elongate, cauda short and usually straight with flexed tip.

### Key

- 1a. Cauda short, flexed along its length . . . . . *Grammoplites portuguesis* 155.3
- 1b. Cauda straight with flexed tip . . . . . 2
- 2a. Dorsal depression elongate . . . . . 3
- 2b. Dorsal depression approximately oval and deep . . . . 5
- 3a. Ostium relatively elongate; caudal tip short and distinctly flexed . . . . . *Sorsogona prionota* 155.7



- 3b. Ostium broader; caudal tip barely flexed . . . . . 4  
 4a. Posterior margin roundly angled; ventral margin groove not distinct; ventral margin slightly irregular . . . . . *Platycephalus indicus* 155.6  
 4b. Posterior margin emarginate and angled; ventral margin groove distinct; ventral margin crenate . . . . .  
 . . . . . *Thysanophrys arenicola* 155.8  
 5a. Crista superior constricted at neck; caudal tip slightly flexed and short . . . . . *Cociella crocodila* 155.1  
 5b. Crista superior barely constricted at neck; caudal tip distinctly flexed and moderately long. . . *Cociella* sp. 155.2

***Cociella crocodila*, SSF No. 155.1 PLATE 54**

**DISTRIBUTION:** Widespread from Durban northward and from Red Sea to Japan and Guadacanal. Attains 50 cm.

**MATERIAL:** 2/2 (5.1, 11.0 mm OD, 135, 295 mm TL), PEM 0609, 6617; ORI and Tugela bank; Id. GJBR, MJS.

**Otolith shape:** Oblong to slightly triangular shape. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Sharply raised; **sculpture,** slightly irregular or notched. **Ventral margin:** Flat and slightly irregular. **Posterior margin:** Sharply rounded and entire. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph with poorly defined anterior colliculum and depressed posterior. **Pseudocolliculum:** Absent. **Ostium:** Walls parallel with low elongate colliculum. **Cauda:** Deeper than ostium, ventral wall straight, slight ventral bend at tip. **Ostio-caudal differentiation:** Slight dorso-ventral constrictions. **Ostium/cauda:** 1:0.7, 1:0.6. **Collum:** Slight step down to cauda. **Crista superior:** Well developed over ostium, ridge-like over neck and cauda. **Crista inferior:** Poor under ostium, well developed elsewhere. **Dorsal depression:** Deep and oval above cauda. **Ventral depression:** Absent, may be shallow groove along margin. **Rostrum:** Small and sharply rounded. **Antirostrum:** Small and rounded. **Excisura:** Moderate, notch shallow, angle wide.

***Cociella* sp., SSF No. 155.2 PLATE 54**

**DISTRIBUTION:** East London to Madagascar and Oman. Attains 50 cm.

**MATERIAL:** 3/4 (4.4-9.2 mm OD, 106-236 mm TL), PEM 15270, 15269, 15268 (all RUSI 36880); Tugela Bank; Id. STF, MJS, MEA.

**Otolith shape:** Oblong. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Slightly raised and slightly rounded; **sculpture,** slightly irregular. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Pointed and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, very low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Elongate and narrow, walls approximately parallel. **Cauda:** Approximately horizontal, straight with distinct short, sharp flexion near tip. **Ostio-caudal differentiation:** Ventrally constricted, ostium and cauda poorly differentiated. **Ostium/cauda:** 1:0.8, 1:0.6, 1:0.7. **Collum:** Absent. **Crista superior:** Poorly developed above ostium, ridge-like from neck to flexion, poor after flexion. **Crista inferior:** Well developed along sulcus. **Dorsal depression:** Oval and deep from neck to flexion. **Ventral depression:** Absent, very shallow groove near margin. **Rostrum:** Short and sharply rounded. **Antirostrum:** Absent. **Excisura:** Narrow, notch absent.

***Grammolites portuguesus*, SSF No. 155.3 PLATE 54**

**DISTRIBUTION:** Known only from Durban to Beira. Attains 17 cm.

**MATERIAL:** 2/2 (6.42, 7.28 mm OD, 130, 160 mm TL), PEM 0607, 0608; fish market, Durban; Id. GJBR.

**Otolith shape:** Oblong. **Thickness:** Moderately thin. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded; **sculpture,** irregular. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Sharply rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph with two extremely low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Elongate, walls parallel with low, flat colliculum. **Cauda:** Short, entire cauda slightly flexed, ending bluntly well before margin. Deeper than ostium with depressed colliculum. **Ostio-caudal differentiation:** Slight dorso-ventral constrictions. **Ostium/cauda:** 1:0.8, 1:0.7. **Collum:** Absent. **Crista superior:** Well developed above ostium, ridge-like over cauda. **Crista inferior:** Well developed along the entire length. **Dorsal depression:** Oval above cauda. **Ventral depression:** Absent, groove from ostium to behind caudal tip, near margin. **Rostrum:** Small and sharply rounded. **Antirostrum:** Minute and rounded. **Excisura:** Moderate, notch shallow, angle varies.

***Platycephalus indicus*, SSF No. 155.6 PLATE 54**

**DISTRIBUTION:** Widespread, from Mossel Bay northwards; eastern Mediterranean; Red Sea to Japan and Australia. Attains 100 cm.

**MATERIAL:** 4/17 (4.52-12.6 mm OD, 154-563 mm TL), PEM 1037, 6651 (RUSI 20011), 6108, 5457; Natal and Cape south coast; Id. MJS, PCH.

**Otolith shape:** Oblong. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral concave. **Dorsal margin:** Slightly rounded; **sculpture,** irregular. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Pointed or sharply rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, two extremely low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Elongate with low, flat colliculum. **Cauda:** Generally straight with slight ventral flex at tip, with extremely low colliculum. **Ostio-caudal differentiation:** Dorso-ventral constrictions. **Ostium/cauda:** 1:0.8, 1:0.7, 1:0.9, 1:0.7. **Collum:** Absent. **Crista superior:** Ridge-like over cauda, well developed over ostium and caudal tip. **Crista inferior:** Well developed along entire length of sulcus. **Dorsal depression:** Deep and elongate above cauda. **Ventral depression:** Absent, shallow ventral groove near margin. **Rostrum:** Broad and pointed. **Antirostrum:** Small or large and pointed. **Excisura:** Moderate, notch either shallow or deep, angle acute.

***Sorsogona prionota*, SSF No. 155.7 PLATE 54**

**DISTRIBUTION:** Delagoa Bay northward to Karachi and through the Red Sea. Attains 22 cm.

**MATERIAL:** 2/2 (7.2, 7.5 mm OD, 155, 196 mm TL), PEM 6427, 15546 (RUSI 42632); Eilat and Durban; Id. MJS, PCH.

**Otolith shape:** Oblong and elongate. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Rounded; **sculpture,** irregular. **Ventral margin:** Slightly rounded and irregular. **Posterior margin:** Sharply rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior depressed in centre, posterior indistinct. **Pseudocolliculum:** Absent. **Ostium:** Elongate parallel walls, colliculum oblong. **Cauda:** Short, slightly flexed tip, low colliculum. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:0.7, 1:0.7. **Collum:** Absent. **Crista superior:** Ridge-like, except extremes well developed. **Crista inferior:** Well developed. **Dorsal depression:** Elongate, very deep over cauda. **Ventral depression:** Absent, indistinct groove near margin. **Rostrum:** Small and sharply rounded. **Antirostrum:** Absent. **Excisura:** Narrow, notch absent.

***Thysanophrys arenicola*, SSF No. 155.8 PLATE 54**

**DISTRIBUTION:** Natal north to Seychelles; Chagos Archipelago, Indonesia, Australia, Philippines and Marshall Ids. Attains 23 cm.

**MATERIAL:** 1/1 (4.85 mm OD, 160 mm TL), PEM 15634; Comoro Ids; Id. PCH.

**Otolith shape:** Oblong and elongate. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Rounded; **sculpture**, irregular. **Ventral margin:** Slightly rounded and crenate. **Posterior margin:** Angled to point, emarginate and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior depressed in centre, posterior indistinct. **Pseudocolliculum:** Absent. **Ostium:** Moderately wide, elongate parallel walls, colliculum oblong. **Cauda:** Short, slightly flexed tip, low colliculum (tip may not be closed). **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:0.7. **Collum:** Absent. **Crista superior:** Low ridge except extremes, well developed. **Crista inferior:** Well developed. **Dorsal depression:** Elongate. **Ventral depression:** Absent, distinct groove near margin. **Rostrum:** Moderate and sharply rounded. **Antirostrum:** Absent, or minute and sharply rounded. **Excisura:** Moderate, notch, if present, very shallow, angle wide.

**HOPLICHTHYIDAE Nelson No. 270**

**Family characteristics:** Only one species. Otolith square, up to c. 5 mm OD, Heterosulcoid sulcus, opens mesially, key-hole shaped. Heteromorph, anterior colliculum depressed, posterior appears rod-like with raised ventral edge.

***Hoplichthys acanthopleurus*, SSF No. 156.1 PLATE 55**

**DISTRIBUTION:** Rare, tropical western Indian Ocean. Attains 18 cm.

**MATERIAL:** 4/7 (4.6-4.8 mm OD, 127-138 mm TL), PEM 12882, 12884, 12943, 12881 (RUSI 28353); off Mozambique; Id. MJS, PCH.

**Otolith shape:** Approximately square with rounded corners. **Thickness:** Moderately thick. **Form:** - Mesial slightly convex, - Lateral convex. **Dorsal margin:** Approximately flat; **sculpture**, slightly irregular. **Ventral margin:** Approximately straight and slightly irregular. **Posterior margin:** Approximately straight with lobe behind cauda. **Sulcus acusticus:** Mesial, heterosulcoid, sulcus key-hole shaped. **Colliculum:** Heteromorph, depressed anterior, raised dorsal margin to rod-like posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Circular, may have deep pit. **Cauda:** Approximately horizontal, short. **Ostio-caudal differentiation:** Dorsio-ventrally constricted. **Ostium/cauda:** 1:0.9, 1:0.9, 1:1.1, 1:0.9. **Collum:** Absent. **Crista superior:** Absent or very poor over ostium, well developed along cauda. **Crista inferior:** Well developed. **Dorsal depression:** Rectangular and shallow over sulcus. **Ventral depression:** Absent, indistinct groove along margin. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

**PSYCHROLUTIDAE Nelson No. 279**

**Family characteristics:** Otoliths either square or oval with margins lobed, up to c. 8 mm OD. Archaeosulcoid, open mesially. Homomorph with single colliculum which is raised and indented or pit-like.

**Key**

- 1a. Otolith square and lobed; colliculum raised, indented on dorsal margin . . . *Psychrolutes inermis* 160.3
- 1b. Otolith oval and lobed; colliculum with pit, not raised . . . . . 2

- 2a. Dorsal margin with relatively small lobes; otolith almost bilaterally symmetrical . . . . . *Ebinania costaecanarie* 160.2
- 2b. Dorsal with large, irregular lobes; otolith not bilaterally symmetrical . . . . . *Psychrolutes macrocephalus* 160.4

***Ebinania costaecanarie*, SSF No. 160.2 PLATE 55**

**DISTRIBUTION:** Off north-western South Africa; Morocco to Namibia. Attains at least 30 cm.

**MATERIAL:** 2/2 (7.3, 8.0 mm OD, 206, 285 mm TL), PEM 14456 (RUSI 31464), 14457 (RUSI 31465); off Cunene River mouth; Id. MJS, PCH.

**Otolith shape:** Approximately oval and lobed. **Thickness:** Thick. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Rounded; **sculpture**, lobed. **Ventral margin:** Slightly rounded and lobed. **Posterior margin:** Lobed and notched. **Sulcus acusticus:** Mesial, archaeosulcoid. **Colliculum:** Homomorph, single colliculum with large pit. **Pseudocolliculum:** Absent. **Ostium and cauda:** Undifferentiated, oval deep pit with rings almost fills colliculum. **Ostio-caudal differentiation:** Absent. **Collum:** Absent. **Crista superior:** Absent. **Crista inferior:** Absent. **Dorsal depression:** Absent. **Ventral depression:** Absent. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

***Psychrolutes inermis*, SSF No. 160.3 PLATE 55**

**DISTRIBUTION:** Known only from a few specimens from off Mauritania, western South Africa and the Mozambique Channel. Specimens reported as *P. inermis* from off Japan probably represent a distinct species. Attains at least 36 cm.

**MATERIAL:** 1/1 (7.4 mm OD, 401 mm TL), PEM 14622; off Namibia; lodged in SAM.

**Otolith shape:** Approximately squared. **Thickness:** Thick. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Approximately flat; **sculpture**, lobed. **Ventral margin:** Approximately flat and sinuate. **Posterior margin:** Lobed and notched. **Sulcus acusticus:** Mesial, archaeosulcoid. **Colliculum:** Homomorph, single raised colliculum. **Pseudocolliculum:** Absent. **Ostium and cauda:** Undifferentiated, raised colliculum with shallow pit towards the dorsal margin. **Ostio-caudal differentiation:** No constrictions. **Collum:** Absent. **Crista superior:** Absent. **Crista inferior:** Absent. **Dorsal depression:** Absent. **Ventral depression:** Broad, shallow depression below colliculum. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

***Psychrolutes macrocephalus*, SSF No. 160.4 PLATE 55**

**DISTRIBUTION:** Known only from South Africa. Attains c. 30 cm.

**MATERIAL:** 5/47 (3.7-6.4 mm OD, 67-218 mm TL), PEM 12387, 12386, 14327 (RUSI 28354), 12207, 13690; west coast; Id. MJS, PCH.

**Otolith shape:** Approximately oval and lobed. **Thickness:** Thick. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Slightly rounded; **sculpture**, lobed. **Ventral margin:** Slightly rounded and lobed. **Posterior margin:** Rounded and lobed. **Sulcus acusticus:** Mesial, archaeosulcoid. **Colliculum:** Homomorph, single colliculum with pit. **Pseudocolliculum:** Absent. **Ostium and cauda:** Undifferentiated, pit deepens in colliculum, becoming more circular with growth. **Ostio-caudal differentiation:** No constrictions. **Collum:** Absent. **Crista superior:** Absent. **Crista inferior:** Absent. **Dorsal depression:** Absent. **Ventral depression:** Shallow when present. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.



(AMBASSIDAE in SSF)

**Family characteristics:** Rounded ovate, up to c. 5 mm OD. Heterosulcoid, opening ostial but cauda indistinctly closed. Dorsal margin of cauda slightly flexed at tip. Heteromorph, low colliculi. Otoliths similar to Caproidae.

### Key

- |     |  |                                     |
|-----|--|-------------------------------------|
| 1a. | Rostrum very broad and blunt; ventral margin of otolith well rounded to keeled; ostium oval, angled upwards, opens onto dorsal margin of rostrum . . . . . | <i>Ambassis gymnocephalus</i> 163.1 |
| 1b. | Rostrum broad and rounded or bluntly rounded; ventral margin of otolith rounded; ostium oval, not angled upwards, opens anteriorly . . . . .               | 2                                   |
| 2a. | Postero-ventral corner of ostium right-angled; ventral area of otolith wide; sulcus placed slightly dorsal to midline . . . . .                            | <i>Ambassis natalensis</i> 163.2    |
| 2b. | Postero-ventral corner of ostium rounded; ventral area of otolith slightly narrower; sulcus approximately in midline . . . . .                             | <i>Ambassis productus</i> 163.3     |

*Ambassis gymnocephalus*, SSF No. 163.1 PLATE 55

**DISTRIBUTION:** Tropical waters of Indian Ocean, Indonesia and Philippines; extends south on our coast at least to Algoa Bay. Attains 10 cm.

**MATERIAL:** 4/4 (1.7-2.6 mm OD, 29-43 mm SL), PEM 6840, 6841, 6842, 6839; St Lucia estuary; Id. TJM.

**Otolith shape:** Rounded-ovate. **Thickness:** Moderately thick. **Form:** - Mesial slightly convex, - Lateral convex. **Dorsal margin:** Well rounded; **sculpture,** irregular. **Ventral margin:** Well rounded to keeled and irregular. **Posterior margin:** Rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, large anterior colliculum depressed in the centre, posterior colliculum is low. **Pseudocolliculum:** Absent. **Ostium:** Oval, angled upwards, opening onto dorsal margin of rostrum, deeper than cauda, colliculum oval. **Cauda:** Approximately horizontal, dorsal margin slightly flexed at tip, colliculum margin raised close to ventral margin, tip indistinct. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:1.1 = 6839 (others eroded). **Collum:** Absent, step up to cauda. **Crista superior:** Well developed to low ridge along entire sulcus, except at caudal tip. **Crista inferior:** Well developed along sulcus. **Dorsal depression:** Oval above crista. **Ventral depression:** Absent, groove present parallel to ventral margin. **Rostrum:** Large, broad and rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Moderate, notch very shallow, angle wide.

*Ambassis natalensis*, SSF No. 163.2 PLATE 55

**DISTRIBUTION:** Natal south to Umtata River, reported from east Africa. Attains 9 cm.

**MATERIAL:** 5/12 (2.0-3.7 mm OD, 40-66 mm SL), PEM 6844, 2162, 6845, 0833, 6843; Natal and Swartkops estuary; Id. TJM, GJBR.

**Otolith shape:** Rounded-ovate becoming more angular. **Thickness:** Moderately thick. **Form:** - **Mesial** slightly convex, - **Lateral** convex. **Dorsal margin:** Rounded; **sculpture**, lobed to irregular. **Ventral margin:** Rounded and irregular to crenate. **Posterior margin:** Sharply rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, colliculi very low and poorly defined. **Pseudocolliculum:** Absent. **Ostium:** Oval, postero-ventral corner is right-angled, deeper than cauda. **Cauda:** Approximately horizontal, dorsal margin is flexed at posterior end, narrowing at tip and ending close to margin. **Ostio-caudal differ-**

**entiation:** Ventrally constricted. **Ostium/cauda:** 1:1.1, 1:1.1, 1:1.4, 1:1.1, 6843 broken. **Collum:** Absent, step to cauda. **Crista superior:** Ridge-like above neck, well developed elsewhere but absent at caudal tip. **Crista inferior:** Well developed under ostium, poor under cauda. **Dorsal depression:** Oval and deep. **Ventral depression:** Absent, groove may be present. **Rostrum:** Short, broad and rounded. **Antirostrum:** Minute and rounded to sharply rounded. **Excisura:** Moderate, notch shallow, angle varies.

*Ambassis productus*, SSF No. 163.3 PLATE 55

**DISTRIBUTION:** Madagascar and east African coast to at least southern Natal. Attains 15 cm.

**MATERIAL:** 2/3 (4.2, 4.7 mm OD, 69, 86 mm SL), PEM 6848, 6846; Kosi Bay; Id. TJM.

**Otolith shape:** Rounded-ovate. **Thickness:** Moderately thick. **Form:** - Mesial slightly convex, - Lateral convex. **Dorsal margin:** Rounded; **sculpture,** irregular. **Ventral margin:** Rounded and irregular. **Posterior margin:** Rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, very low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Oval, postero-ventral corner not right-angled. **Cauda:** Approximately straight, dorsal margin flexed ventrally at tip, not distinctly closed, ending near margin. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:1.1, 6846 broken. **Collum:** Absent, step up to cauda. **Crista superior:** Ridge-like above neck, well developed elsewhere, absent at tip. **Crista inferior:** Well developed under posterior ostium, poorly developed under cauda, absent at extremes. **Dorsal depression:** Oval and deep. **Ventral depression:** Absent, indistinct, broad lunate groove may be present. **Rostrum:** Broad and bluntly rounded. **Antirostrum:** Small and rounded. **Excisura:** Moderate, notch shallow, angle wide.

**PERCICHTHYIDAE Nelson No. 283**  
(POLYPRIONIDAE in SSF)

**Family characteristics:** Only one species. Otolith oblong to fusiform up to at least 20 mm OD. Heterosulcoid, ostial opening, heteromorph with low colliculi, sulcus elongate and narrow.

*Polyprion americanus*, SSF No. 165.1 PLATE 56

**DISTRIBUTION:** North Atlantic (apparently rare on the American side) and Mediterranean; in the eastern Atlantic, from Norway to South Africa; also at Tristan da Cunha, Vema Sea Mount, St Paul and Amsterdam islands. Attains 2 m.

**MATERIAL:** 3/9 (15.0-20.1 mm OD, 530-805 mm TL), PEM 12638, 12092, 10363; Cape south coast; Id. MJS, PCH.

**Otolith shape:** Oblong to fusiform. **Thickness:** Moderate. **Form:** - **Mesial** slightly convex, - **Lateral** concave. **Lateral surface:** Very grooved from margin. **Dorsal margin:** Slightly rounded; sculpture, irregular. **Ventral margin:** Slightly rounded and irregular. **Posterior margin:** Sharply rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior and posterior colliculi slightly raised. **Pseudocolliculum:** Absent. **Ostium:** Slightly flared dorsally with oval colliculum, and uneven floor. **Cauda:** Narrow and almost straight with slight ventral flexion near tip. **Ostio-caudal differentiation:** Slight dorso-ventral constrictions. **Ostium/cauda:** 1:1.2, 1:1.2, 1:1.1. **Collum:** Absent. **Crista superior:** Ridge-like but well developed at extremes. **Crista inferior:** Well developed along length of sulcus. **Dorsal depression:** Oval and deep, above cauda. **Ventral depression:** May be small and elongated depression in large otoliths. **Rostrum:** Large, elongate and sharply rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Wide, notch shallow and angle acute.

**PERCICHTHYIDAE Nelson No. 283  
(ACROPOMATIDAE in SSF)**

**Family characteristics:** Variations in the otolith shape suggest this to be a polyphyletic family. Shapes vary, oval to ovate, elliptic and oblong, up to c. 8 mm OD. Heterosulcoid with ostial opening, heteromorph, usually with anterior more distinct than the posterior colliculum. Ostium may be deeply indented, cauda straight or variably flexed.

**Key**

- 1a. Otolith oblong; ostium horizontal, with distinct constriction in crista superior at neck behind elongate ostium; cauda straight or with very slight ventral curve . . . . . *Synagrops microlepis* 176.6
- 1b. Otolith approximately ovate or elliptic; ostium either flared dorsally or horizontal with no constriction in crista superior at neck; cauda straight or flexed . . . . . 2
- 2a. Cauda approximately straight or very slightly flexed at tip . . . . . 3
- 2b. Cauda strongly flexed . . . . . 4
- 3a. Otolith rounded ovate; ventral margin very serrate or very irregular; ostium and cauda horizontal; crista superior horizontal with no constriction at neck . . . . . *Howella sherborni* 176.2
- 3b. Otolith oval-ovate; ventral margin slightly crenate or irregular; ostium angled and bulbous ventrally; cauda approximately straight with slight ventral flexion near caudal tip; crista superior with constriction at neck . . . . . *Acropoma japonicum* 176.1
- 4a. Otolith approximately ovate; dorsal margin emarginate, raised posteriorly; ventral margin flattened and angled anteriorly; ostium flared with large protruding colliculum (may be broken); cauda flexed in posterior third . . . . . *Neoscombrops annectens* 176.3
- 4b. Otolith elliptic, narrows anteriorly; dorsal margin rounded; ventral margin rounded, oblique anteriorly; ostium short and wide with raised colliculum; cauda angled dorsally with hook-like ventral flexion . . . . . *Synagrops japonicus* 176.5

***Acropoma japonicum*, SSF No. 176.1 PLATE 56**

**DISTRIBUTION:** Off Natal also in northern Indian Ocean, Philippines and Japan. Attains 20 cm.

**MATERIAL:** 4/16 (5.1-8.1 mm OD, 88-136 mm TL), PEM 13064, 13023, 12995 (RUSI 28522), 12963 (RUSI 28369), [14935 (RUSI 35515)]; off Mozambique; Id. MJS, PCH.

**Otolith shape:** Oval-ovate. **Thickness:** Moderately thick. **Form:** - Mesial slightly convex, - Lateral convex. **Dorsal margin:** Slightly rounded; **sculpture**, crenate or irregular. **Ventral margin:** Rounded or crenate and irregular. **Posterior margin:** Rounded or blunt and crenate or irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, posterior indistinct. Slightly raised anterior colliculum becomes depressed with growth (>5.5 mm OD). **Pseudocolliculum:** Absent. **Ostium:** Oval and depressed, bulbous ventrally. **Cauda:** Approximately straight, slightly flexed ventrally, tip poorly defined. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.5, 1:1.2, 1:1.1, 1:1.3. **Collum:** Absent, may be a step up to cauda. **Crista superior:** Low ridge from ostium to flexion, tip poorly defined. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Large, shallow and oval. **Ventral depression:** Absent, shallow groove from ostium to caudal tip. **Rostrum:** Short, broad and pointed. **Antirostrum:** Absent or very small and rounded. **Excisura:** Moderate, notch very shallow if present, angle varies.

***Howella sherborni*, SSF No. 176.2 PLATE 56**

**DISTRIBUTION:** Off Cape Town to Natal; widely distributed in all three major oceans. Attains 8 cm.

**MATERIAL:** 3/8 (4.0-4.6 mm OD, 105-114 mm TL), PEM 14331, 13247, 13206; Cape west coast; lodged in SAM.

**Otolith shape:** Rounded ovate. **Thickness:** Thin. **Form:** - Mesial flat, - Lateral flat. **Dorsal margin:** Raised and rounded or flat; **sculpture**, slightly irregular. **Ventral margin:** Rounded or angular, serrate and irregular. **Posterior margin:** Rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low anterior, very indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Elongate and oval. **Cauda:** Approximately horizontal, rounded tip. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:1.3, 1:1.3, 1:1.1. **Collum:** Absent. **Crista superior:** Low ridge along entire sulcus. **Crista inferior:** Very poorly developed under ostium and caudal tip, well developed under cauda. **Dorsal depression:** Shallow, covering most of dorsal area. **Ventral depression:** Crescent-shaped and very shallow. **Rostrum:** Moderate, broad and pointed. **Antirostrum:** Small and rounded. **Excisura:** Moderate, notch shallow, angle varies.

***Neoscombrops annectens*, SSF No. 176.3 PLATE 56**

**DISTRIBUTION:** Common off Natal and southern Mozambique. Attains 25 cm.

**MATERIAL:** 4/24 (3.6-6.6 mm OD, 67-210 mm TL), PEM 12962, 11350 (RUSI 28367), 12891, 12964, [14923, 14924, 14932, 14933, 14934 (all five RUSI 35601)]; Mozambique and southern Cape; Id. MJS, PCH, MEA.

**Otolith shape:** Approximately ovate. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral convex. **Dorsal margin:** Emarginate anteriorly, raised posteriorly; **sculpture**, crenate or lobed. **Ventral margin:** Rounded or flat and angled anteriorly and slightly irregular. **Posterior margin:** Flat and crenate or lobed. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, rod-like colliculum penetrates excisura, posterior indistinct and indented. **Pseudocolliculum:** Absent. **Ostium:** Very deep, reduced with protruding colliculum. **Cauda:** Straight and narrow, strongly flexed in posterior third. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.4, 11350 broken, 1:1.5, 1:1.6. **Collum:** Absent, step up to cauda. **Crista superior:** Well developed above ostium, ridge-like from ostium to flexion, well developed thereafter. **Crista inferior:** Short ridge under ostium, well developed under cauda. **Dorsal depression:** Oval, shallow and large. **Ventral depression:** Deep and circular below neck, margin depressed under caudal tip. **Rostrum:** Including colliculum, large, broad and pointed. **Antirostrum:** Large and pointed. **Excisura:** Moderate or wide, notch deep, angle acute.

***Synagrops japonicus*, SSF No. 176.5 PLATE 56**

**DISTRIBUTION:** Widely distributed from South Africa to Hawaii. Attains 30 cm.

**MATERIAL:** 4/44 (4.3-6.8 mm OD, 105-245 mm TL), PEM 11607 (RUSI 28368), 12625, 14416 (RUSI 34073), 14420, [11354 (RUSI 34064), 12535 (RUSI 34078), 12894 (RUSI 34062), 14445 (RUSI 28365), 15018-15024 (RUSI 35605)]; Cape south coast; Id. MJS, PCH, MEA.

**Otolith shape:** Elliptic. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Rounded; **sculpture**, crenate or irregular. **Ventral margin:** Rounded and oblique anteriorly, crenate or irregular. **Posterior margin:** Rounded and crenate or irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph with low anterior colliculum, indistinct posterior colliculum. **Pseudocolliculum:**



Absent. **Ostium**: Oval, with raised protruding colliculum, deep at edges. **Cauda**: Almost horizontal, angled dorsally with hook-like flexion, widening posteriorly. Neck area poorly defined with dorsal bulge. **Ostio-caudal differentiation**: Dorso-ventrally constricted. **Ostium/cauda**: 1:1.6, 1:1.8, 1:1.7, 1:2.0. **Collum**: Absent. **Crista superior**: Well developed over ostium and after flexion, ridge-like from neck to flexion. **Crista inferior**: Well developed along sulcus. **Dorsal depression**: Shallow in small (c. 4.3 mm OD), absent in large otoliths. **Ventral depression**: Shallow depression under neck, margin depressed under caudal tip. **Rostrum**: Short, broad and sharply rounded. **Antirostrum**: Absent or small and sharply rounded. **Excisura**: Moderate, notch shallow, angle wide.

#### *Synagrops microlepis*, SSF No. 176.6 PLATE 56

**DISTRIBUTION**: Known only from Luanda to Walvis Bay. Attains 10 cm.

**MATERIAL**: 2/2 (6.6, 7.1 mm OD, 112, 120 mm TL), PEM 14455 (RUSI 31378), 14454 (RUSI 31380); off Cunene River mouth; Id. RWL, MJS, PCH.

**Otolith shape**: Approximately oblong. **Thickness**: Thin. **Form**: - Mesial flat, - Lateral slightly convex. **Dorsal margin**: Rounded or slightly raised; **sculpture**, crenate. **Ventral margin**: Slightly rounded and slightly irregular. **Posterior margin**: Rounded and crenate. **Sulcus acusticus**: Ostial, heterosulcoid. **Colliculum**: Heteromorph, low anterior colliculum, posterior colliculum has ventral edge raised, depressed in centre. **Pseudocolliculum**: Absent. **Ostium**: Oval, narrows anteriorly, sulcus approximately horizontal. **Cauda**: Straight, very slight ventral curve, tip poorly defined. **Ostio-caudal differentiation**: Dorso-ventrally constricted. **Ostium/cauda**: 1:1.1, 1:1.3. **Collum**: Absent. **Crista superior**: Absent over anterior ostium, ridge-like from ostium along cauda, absent at tip. **Crista inferior**: Poorly developed under ostium, well developed under cauda. **Dorsal depression**: Shallow and narrow. **Ventral depression**: Absent. **Rostrum**: Short, broad and pointed. **Antirostrum**: Absent or small and sharply rounded. **Excisura**: Moderate, notch shallow, angle acute.

#### SERRANIDAE Nelson No. 284

**Family characteristics**: Oblong to ovate or fusiform otolith shape. Up to at least 23 mm. All species heterosulcoid with ostial opening but some have cauda which is not distinctly closed, therefore may appear ostio-caudal. All heteromorph but anterior colliculum low and some have posterior colliculum which is barely visible. Ostium usually oval to elongate with cauda flexed. The three subfamilies may be distinguished by the following:

**Anthiinae** (described here are the genera: *Acanthistius*, *Anthias*, *Holanthias*, *Nemanthias*) generally have small otoliths up to c. 14 mm OD.

**Epinephelinae** (described here are the genera: *Aethaloperca*, *Cephalopholis*, *Cromileptes*, *Epinephelus*, *Plectropomus*, *Variola*) are generally large with at least one member of this group up to 23 mm OD. Characteristic of this group is the crista inferior which is ridge-like from the flexion to the caudal tip. There is often a raised area or plateau between the sulcus and the ventral margin of the otolith.

**Serraninae** (described here is the genus *Serranus*), are small, up to c. 8 mm OD, the crista inferior is not ridge-like under the flexion. **NOTE**: No key provided. The species within the subfamilies are similar. The subtle differences would best be distinguished by direct comparison with whole voucher otoliths. Characters of particular use to differentiate the species are: shape of ostium and cauda, depth of sulcus and degree of flexion of caudal tip.

#### *Acanthistius sebastoides*, SSF No. 166.1 PLATE 57

**DISTRIBUTION**: From Namibia to Maputo. Attains 35 cm.

**MATERIAL**: 6/68 (2.55-11.2 mm OD, 46-267 mm TL), PEM 5200, 1877 (RUSI 9256), 9799, 5810, 4446, 5570; Algoa Bay and Cape south coast; Id. MJS, PCH.

**Otolith shape**: Oblong to fusiform. **Thickness**: Moderately thin. **Form**: - Mesial convex, - Lateral concave. **Dorsal margin**: Slightly rounded; **sculpture**, irregular to crenate. **Ventral margin**: Slightly rounded and slightly irregular. **Posterior margin**: Angled to sharply rounded and notched. **Sulcus acusticus**: Ostial, heterosulcoid. **Colliculum**: Heteromorph, anterior low, posterior very indistinct, indented. **Pseudocolliculum**: Absent. **Ostium**: Narrow and elongate, extends onto rostrum. **Cauda**: Ventrally flexed near end, caudal tip may be close to ventral margin in large otoliths. **Ostio-caudal differentiation**: Dorso-ventrally constricted. **Ostium/cauda**: 1:1.1, 1:1.1, 1:1.1, 1:0.8, 1:0.9, 1:1.1. **Collum**: Absent, step up to cauda. **Crista superior**: Well developed, poor at extremes. **Crista inferior**: Well developed along entire sulcus. **Dorsal depression**: Oval, may be anterior depression over and continuous with ostium. **Ventral depression**: Absent, groove variable, between ostium and caudal tip, close to margin. **Rostrum**: Large and sharply rounded. **Antirostrum**: Small and pointed. **Excisura**: Wide, notch very shallow, angle acute.

#### *Acanthistius* sp., SSF No. 166.2 PLATE 57

**DISTRIBUTION**: This undescribed species is known from a specimen from Port Alfred, possibly occurs in deeper water than *A. sebastoides*, apparently rare. Attains at least 23 cm.

**MATERIAL**: 1/1 (10 mm OD, 225 mm TL), PEM 7758 (RUSI 28357); ORI; Id. PCH.

**Otolith shape**: Oblong to fusiform. **Thickness**: Moderately thick. **Form**: - Mesial convex, - Lateral concave. **Dorsal margin**: Flattened; **sculpture**, crenate. **Ventral margin**: Flattened, notched posteriorly and slightly irregular. **Posterior margin**: Rounded becoming oblique to sharply rounded and crenate. **Sulcus acusticus**: Ostial, heterosulcoid. **Colliculum**: Heteromorph, anterior low, posterior extremely indistinct, slightly rugose depressed in centre. **Pseudocolliculum**: Absent. **Ostium**: Elongate, opens to dorsal depression and dorsal wall very poorly developed. **Cauda**: Straight, strongly flexed near tip, caudal tip close to ventral margin in large otoliths. **Ostio-caudal differentiation**: Dorso-ventrally constricted. **Ostium/cauda**: 1:1.1. **Collum**: Absent, low step up to cauda. **Crista superior**: Absent over anterior ostium well developed or ridge-like over cauda and after flexion. **Crista inferior**: Well developed along entire sulcus. **Dorsal depression**: Oval behind antirostrum, continuous with ostium. **Ventral depression**: Behind caudal tip, marginal groove between ostium and caudal tip. **Rostrum**: Large and sharply rounded. **Antirostrum**: Small and sharply rounded. **Excisura**: Wide, notch shallow, angle acute.

#### *Anthias connelli*, SSF No. 166.4 PLATE 57

**DISTRIBUTION**: Known only from a small locality in Natal, south of Durban harbour. Attains 11 cm SL.

**MATERIAL**: 2/2 (2.7, 2.9 mm OD, 66, 70 mm TL), PEM 4341, 4340; off the Bluff, Natal; Id. PCH.

**Otolith shape**: Oval to fusiform. **Thickness**: Moderately thin. **Form**: - Mesial slightly convex, - Lateral flat. **Dorsal margin**: Slightly raised; **sculpture**, irregular. **Ventral margin**: Rounded and slightly crenate. **Posterior margin**: Sharply rounded and entire. **Sulcus acusticus**: Ostial, heterosulcoid. **Colliculum**: Homomorph, low anterior colliculum visible. **Pseudocolliculum**: Absent. **Ostium**: Oval, flared dorsally. **Cauda**: Approximately straight, slightly flexed near tip. **Ostio-caudal differentiation**:



Slight dorsal constriction. **Ostium/cauda:** 1:0.7, 1:1.0. **Collum:** Absent but slight step up to cauda. **Crista superior:** Well developed over ostium and caudal tip, ridge-like along the straight part of the cauda. **Crista inferior:** Poorly developed, very poorly developed under ostium. **Dorsal depression:** Shallow and oval. **Ventral depression:** Absent, groove in the ventral area, from caudal tip to ostium. **Rostrum:** Large, broad and sharply rounded. **Antirostrum:** Minute and rounded. **Excisura:** Wide, notch very shallow, angle wide.

***Anthias squamipinnis*, SSF No. 166.9 PLATE 57**

**DISTRIBUTION:** Red Sea and western Indian Ocean from Natal to Japan, Philippines, Australia and Marshall Islands. Juveniles occur south to Algoa Bay. Attains 10 cm SL.

**MATERIAL:** 3/31 (2.35-3.7 mm OD, 61-111 mm TL), PEM 2657, 14252 (RUSI 35150), 4373; Ledsman shoal, Comoro Ids and Sodwana Bay; Id. MJS, PCH.

**Otolith shape:** Oval becoming fusiform. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Rounded becoming raised; **sculpture**, irregular. **Ventral margin:** Slightly rounded and crenate. **Posterior margin:** Blunt or sharply rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior low, posterior indistinct, depressed in centre. **Pseudocolliculum:** Absent. **Ostium:** Approximately oval, ventral edge straight to sinuous. **Cauda:** Slightly flexed along its length, tip not distinctly closed. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1, 1:0.9, 1:0.9. **Collum:** Absent, slight step may be present. **Crista superior:** Well developed over ostium, ridge-like between neck and flexion, poorly developed at caudal tip. **Crista inferior:** Poorly developed under ostium, well developed elsewhere. **Dorsal depression:** Elongate and shallow. **Ventral depression:** Absent, shallow wide groove from cauda to mid ventral area. **Rostrum:** Broad and rounded. **Antirostrum:** Absent or small and pointed. **Excisura:** Moderate to wide, notch absent or shallow, angle wide.

***Holanthias natalensis*, SSF No. 166.12 PLATE 57**

**DISTRIBUTION:** Known from East London to Madagascar and Reunion. Attains at least 37 cm SL.

**MATERIAL:** 5/5 (9.5-13.88 mm OD, 240-469 mm TL), PEM 6489, 15481 (RUSI 40619), 15482 (RUSI 40621), 8807, 0604H; Natal; Id. TH, MJS, PCH.

**Otolith shape:** Oval becoming oblong with growth. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Raised or approximately flat; **sculpture**, irregular. **Ventral margin:** Slightly rounded and irregular. **Posterior margin:** Bluntly rounded in large (c. 13 mm OD), pointed in small (9.5 mm OD) otoliths and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior low, posterior extremely indistinct, depressed in centre, may be rough. **Pseudocolliculum:** Absent. **Ostium:** Elongate and shallow. **Cauda:** Almost straight and elongate, tip barely flexed, deeper than ostium. **Ostio-caudal differentiation:** Dorso-ventrally constricted, ventral constriction hooked. **Ostium/cauda:** 1:1, 1:1.1, 1:1, 1:1, 1:1.2. **Collum:** Absent, rounded step may be present. **Crista superior:** Well developed over ostium, ridge-like, strong and narrow to caudal tip. **Crista inferior:** Poorly developed under ostium, well developed elsewhere. **Dorsal depression:** Oval, deep and elongate, may reach margin. **Ventral depression:** Absent, wide groove from ostium to tip of cauda, close to margin. **Rostrum:** Large and bluntly rounded. **Antirostrum:** Absent to minute and rounded in the large otoliths. **Excisura:** Wide, notch absent in small (c. 9.5 mm OD), notch shallow, angle wide in large otoliths (c. 13 mm OD).

***Nemanthias carberryi*, SSF No. 166.15 PLATE 57**

**DISTRIBUTION:** Widespread in the Indian Ocean, east to the Maldives and south to Natal; adults on Aliwal Shoal south of Durban, juveniles to Port Alfred. Attains 7 cm SL.

**MATERIAL:** 3/6 (2.3-3.0 mm OD, 69-102 mm TL), PEM 14241, 14238, 14239 (all RUSI 30636); Comoro Ids; Id. PCH.

**Otolith shape:** Oval becoming fusiform. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Raised or slightly rounded; **sculpture**, lobed. **Ventral margin:** Slightly rounded and crenate. **Posterior margin:** Sharply rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Homosulcoid, low and indistinct anterior colliculum present. **Pseudocolliculum:** Absent. **Ostium:** Approximately oval, flares widely, becomes elongate. **Cauda:** Slightly flexed along the length, tip not distinctly closed. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.1, 1:1.1, 1:0.9. **Collum:** Absent, step to cauda. **Crista superior:** Well developed over anterior ostium and posterior cauda, ridge-like from mid-ostium along caudal, absent at tip. **Crista inferior:** Very poorly developed at extremes, elsewhere poorly or well developed. **Dorsal depression:** Oval and shallow. **Ventral depression:** Shallow groove from ostium to caudal tip. **Rostrum:** Large, may be broad and sharply rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Wide, notch shallow, angle acute.

***Aethaloperca rogaa*, SSF No. 166.19 PLATE 58**

**DISTRIBUTION:** Widespread; Red Sea and western Indian Ocean from Natal to Persian Gulf, Philippines and Japan. Attains 60 cm.

**MATERIAL:** 3/6 (6.9-9.3 mm OD, 2706 TL not recorded, 370-430 mm TL), PEM 2706, 8186, 8311; Ledsman shoal, Kosi and Sodwana Bays; Id. JER, GJBR, MJS, PCH.

**Otolith shape:** Oval. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Rounded; **sculpture**, irregular. **Ventral margin:** Slightly rounded or flat and irregular. **Posterior margin:** Sharply rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Homomorph, anterior colliculum low, rugose, posterior not visible in material available. **Pseudocolliculum:** Absent. **Ostium:** Shallow and flared. **Cauda:** Straight, strongly flexed near tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1, 1:1.1, 1:0.9. **Collum:** Absent but small step may be present. **Crista superior:** Well developed along sulcus. **Crista inferior:** Poor under ostium, well developed elsewhere. **Dorsal depression:** Narrow and oval, or absent. **Ventral depression:** Absent, groove under cauda, from caudal tip. **Rostrum:** Large, broad and bluntly rounded. **Antirostrum:** Small and pointed or sharply rounded. **Excisura:** Wide, notch shallow, angle wide.

***Cephalopholis argus*, SSF No. 166.21 PLATE 58**

**DISTRIBUTION:** Extends from the Red Sea south to Durban, and to the central Pacific as far as the Pitcairn Group. Attains 50 cm.

**MATERIAL:** 2/2 (3.55, 5.54 mm OD, 95, 115 mm TL), PEM 0870, 1089H; Eilat and Sodwana Bay; Id. TH, JER.

**Otolith shape:** Oblong. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded; **sculpture**, irregular. **Ventral margin:** Slightly rounded, slightly irregular. **Posterior margin:** Bluntly rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, very low anterior, posterior extremely low, slightly rugose. **Pseudocolliculum:** Absent. **Ostium:** Flares dorsally, with low colliculum. **Cauda:** Straight, flexed near tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:0.9, 1:1.1. **Collum:** Absent. **Crista superior:** Poorly developed at extremes, ridge-like from neck to flexion. **Crista inferior:** Poorly



developed at extremes, well developed under cauda. **Dorsal depression:** Elongate, oval. **Ventral depression:** Absent, groove close to margin of large otoliths. **Rostrum:** Large and sharply rounded. **Antirostrum:** Small and pointed, if present. **Excisura:** Wide, notch shallow, angle acute.

***Cephalopholis aurantia*, SSF No. 166.22 PLATE 58**

**DISTRIBUTION:** Known from Mauritius, Reunion, Seychelles, east and southern Africa (to Durban). Rare. Attains 60 cm.

**MATERIAL:** 1/1 (9.8 mm OD, 228 mm TL), PEM 14536 (RUSI 31433); Mauritius; Id. MJS, PCH.

**Otolith shape:** Approximately ovate. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded; **sculpture**, irregular with tooth in mid-dorsal area. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Blunt and lobed. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low anterior, posterior extremely low, slightly rugose. **Pseudocolliculum:** Absent. **Ostium:** Flared, ventral margin approximately straight, filled with colliculum. **Cauda:** Straight, wide, flexed near tip, ending close to margin. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.2. **Collum:** Absent. **Crista superior:** Well developed along sulcus. **Crista inferior:** Poorly developed under ostium, well developed elsewhere. **Dorsal depression:** Shallow and oval. **Ventral depression:** Depressed under flexion, joined by groove near margin. **Rostrum:** Large, elongate and rounded. **Antirostrum:** Small and pointed. **Excisura:** Wide, notch shallow, angle wide.

***Cephalopholis leopardus*, SSF No. 166.25 PLATE 58**

**DISTRIBUTION:** Probably occurs in southern Mozambique. Widespread in the Indo-West Pacific region. Attains 20 cm.

**MATERIAL:** 3/3 (5.8-6.0 mm OD, all 125 mm TL), PEM 14280 (RUSI 28236), 15638, 15625; Comoro Ids; Id. PCH.

**Otolith shape:** Approximately oblong. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded; **sculpture**, slightly irregular. **Ventral margin:** Slightly rounded, notch below caudal tip, slightly irregular. **Posterior margin:** Bluntly rounded and slightly crenate or notched. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, indistinct and extremely low. **Pseudocolliculum:** Absent. **Ostium:** Approximately oval, poorly defined. **Cauda:** Initially straight, flared and flexed towards posterior, tip indistinct. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.5, 1:1.3, 1:1.3. **Collum:** Absent. **Crista superior:** Well developed over ostium, well developed to ridge-like over anterior cauda, well developed after flexion. **Crista inferior:** Poorly developed under ostium, well developed along cauda. **Dorsal depression:** Elongate and oval. **Ventral depression:** Wide, shallow depression under flexion, may join margin groove. **Rostrum:** Large and sharply rounded. **Antirostrum:** Small and pointed. **Excisura:** Wide, notch shallow, angle wide.

***Cephalopholis miniata*, SSF No. 166.26 PLATE 58**

**DISTRIBUTION:** Ranges from the Red Sea south to Natal, and east to the western Pacific. Attains 40 cm.

**MATERIAL:** 3/14 (8.52-11.6 mm OD, 258-372 mm TL), PEM 2753, 8312, 8367; Ledsman Shoal and Sodwana; Id. PCH, MJS.

**Otolith shape:** Ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Flat; **sculpture**, irregular. **Ventral margin:** Slightly rounded and irregular. **Posterior margin:** Blunt, grooved or digitate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior low, posterior barely raised but slightly rugose. **Pseudocolliculum:** Absent. **Ostium:** Flared dorsally, ventral edge of ostium straight. **Cauda:** Straight, flexed near tip. **Ostio-caudal differentiation:**

Dorso-ventrally constricted. **Ostium/cauda:** 1:0.9, 1:1.2, 1:1. **Collum:** Absent, step up to cauda in larger otoliths. **Crista superior:** Well developed along entire sulcus. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Shallow and irregular. **Ventral depression:** Under flexion, shallow groove near margin. **Rostrum:** Large, elongate and sharply rounded. **Antirostrum:** Small and pointed. **Excisura:** Wide, notch shallow, angle usually wide.

***Cephalopholis nigripinnis*, SSF No. 166.27 PLATE 58**

**DISTRIBUTION:** Widely distributed in Indian Ocean, south to Natal. Attains 25 cm.

**MATERIAL:** 2/3 (5.0, 6.7 mm OD, 132, 173 mm TL), PEM 8212 (RUSI 30391), 14522 (RUSI 31447), [7701 (RUSI 34135)]; Mauritius and Kosi Bay; Id. MJS, PCH.

**Otolith shape:** Oval to oblong. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded; **sculpture**, irregular. **Ventral margin:** Slightly rounded and irregular. **Posterior margin:** Slightly rounded to rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior low, posterior indistinct, slightly rugose. **Pseudocolliculum:** Absent. **Ostium:** Dorsal wall flared, ventral wall approximately horizontal. **Cauda:** Approximately straight, flexed near end, tip poorly defined. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.2, 1:1.1. **Collum:** Absent, step to cauda in small otoliths. **Crista superior:** Poor over ostium, well developed or low ridge above cauda. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Elongate and oval. **Ventral depression:** Hook-like below tip of cauda. **Rostrum:** Large and rounded. **Antirostrum:** Small to absent. **Excisura:** Wide, notch shallow, angle wide, if present.

***Cephalopholis sexmaculata*, SSF No. 166.28 PLATE 58**

**DISTRIBUTION:** Red Sea, south to Beira, and east to French Polynesia. Attains 47 cm.

**MATERIAL:** 1/1 (10.58 mm OD, 350 mm TL), PEM 15611; Comoro Ids; Id. PCH, lodged in JLBSII.

**Otolith shape:** Oblong-ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded; **sculpture**, irregular. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Sharply rounded to rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior low, posterior indistinct. **Pseudocolliculum:** Absent. **Ostium:** Broad, dorsal wall flared, ventral wall approximately horizontal. **Cauda:** Narrow at neck, flared and flexed. **Ostio-caudal differentiation:** Dorso-ventrally distinctly constricted. **Ostium/cauda:** 1:1.1. **Collum:** Absent, distinct step to cauda. **Crista superior:** Well developed along entire sulcus. **Crista inferior:** Poorly developed under ostium and after flexion. **Dorsal depression:** Absent, margin may be depressed irregularly. Depression near postero-dorsal corner and groove may penetrate flexion. **Ventral depression:** Shallow under anterior cauda; may be shallow depression near margin. Margin groove shallow. **Rostrum:** Moderate, broad and rounded. **Antirostrum:** Small and pointed. **Excisura:** Moderately wide, notch shallow, angle wide.

***Cephalopholis sonnerati*, SSF No. 166.29 PLATE 59**

**DISTRIBUTION:** Western Indian Ocean (south to Durban) to the central Pacific (Marshall and Gilbert Islands). Attains 57 cm.

**MATERIAL:** 4/25 (6.1-12.0 mm OD, 162-431 mm TL), PEM 8245 (RUSI 34149), 8366 (RUSI 37474), 8172, 8361; Kosi Bay; Id. MJS, PCH.

**Otolith shape:** Oblong. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded;



**sculpture**, irregular. **Ventral margin**: Slightly rounded and irregular to crenate. **Posterior margin**: Bluntly rounded and irregular. **Sulcus acusticus**: Ostial, heterosulcoid. **Colliculum**: Heteromorph, anterior colliculum poorly defined or not visible, posterior slightly rugose and indistinct. **Pseudocolliculum**: Absent. **Ostium**: Fairly straight and narrow, floor irregular. **Cauda**: Straight, distinctly flexed and deep. **Ostio-caudal differentiation**: Dorso-ventrally constricted. **Ostium/cauda**: 1:1.2, 1:1.2, 1:1.1, 1:1. **Collum**: Absent, step up to cauda. **Crista superior**: Well developed, may be ridge-like over anterior cauda, poor at tip. **Crista inferior**: Poorly developed under ostium, well developed becomes ridge-like after flexion. **Dorsal depression**: Elongate and irregular. **Ventral depression**: Present below flexion with notch to margin, shallow groove runs anteriorly. **Rostrum**: Large and sharply rounded. **Antirostrum**: Small and pointed. **Excisura**: Wide, notch shallow, angle acute or wide.

*Cephalopholis spiloparaea*, SSF No. 166.30 PLATE 59

**DISTRIBUTION**: East Africa to French Polynesia and the Pitcairn Group. Attains 22 cm.

**MATERIAL**: 3/3 (6.0-7.66 mm OD, 132-170 mm TL), PEM 14250 (RUSI 28270), 14259 (RUSI 27112), 15784; Comoro Ids; Id. PCH.

**Otolith shape**: Oblong to ovate. **Thickness**: Moderate. **Form**: - **Mesial**: slightly convex, - **Lateral**: slightly concave. **Dorsal margin**: Slightly rounded; **sculpture**, slightly irregular. **Ventral margin**: Slightly rounded and slightly irregular. **Posterior margin**: Blunt with notch and irregular. **Sulcus acusticus**: Ostial, heterosulcoid. **Colliculum**: Heteromorph, very low colliculi. **Pseudocolliculum**: Absent. **Ostium**: Dorsal wall flared and short, ventral wall horizontal. **Cauda**: Straight for 2/3rds of length and gently flexed. **Ostio-caudal differentiation**: Dorso-ventrally constricted. **Ostium/cauda**: 1:1.2, 1:1.1, 1:1.4. **Collum**: Absent, slight step may be present. **Crista superior**: Well developed, poor after flexion. **Crista inferior**: Poorly developed under ostium, well developed under cauda, low ridge after flexion. **Dorsal depression**: Oval and shallow. **Ventral depression**: Under flexion, shallow groove near margin. **Rostrum**: Large and sharply rounded. **Antirostrum**: Absent or extremely small and rounded. **Excisura**: Wide, notch very shallow.

*Cephalopholis urodota*, (Forster, 1801) SSF No. 166.-  
PLATE 59

**DISTRIBUTION**: A wide-ranging species, occurring from East Africa (south to Sodwana Bay); to French Polynesia and the Pitcairn Group (Randall and Heemstra 1991). Attains 273 mm TL.

**MATERIAL**: 2/2 (7.7, 8.1 mm OD, 225, 233 mm TL), PEM 8401 (RUSI 34148), 8199 (RUSI 37506); Kosi Bay; Id. PCH.

**Otolith shape**: Oblong. **Thickness**: Moderate. **Form**: - **Mesial** convex, - **Lateral** concave. **Dorsal margin**: Slightly rounded; **sculpture**, slightly irregular. **Ventral margin**: Slightly rounded and crenate to irregular. **Posterior margin**: Slightly rounded or oblique and crenate to irregular. **Sulcus acusticus**: Ostial, heterosulcoid. **Colliculum**: Heteromorph, anterior colliculum extremely low, posterior indistinct, slightly rugose. **Pseudocolliculum**: Absent. **Ostium**: Elongate, slightly flared dorsally with irregular colliculum. **Cauda**: Straight, strongly flexed near tip, ending close to margin. **Ostio-caudal differentiation**: Dorso-ventrally constricted. **Ostium/cauda**: 1:1.2, 1:1.2. **Collum**: Absent, slight step up to cauda. **Crista superior**: Well developed over ostium, well developed to ridge-like over cauda. **Crista inferior**: Poor under anterior ostium, well developed under posterior ostium and anterior cauda, low ridge under flexion. **Dorsal depression**: Elongate and shallow above crista. **Ventral depression**: Absent, may be a shallow groove near margin. **Rostrum**: Moderate and sharply

rounded. **Antirostrum**: Short and pointed or sharply rounded. **Excisura**: Wide, notch shallow, angle variable.

*Cromileptes altivelis*, SSF No. 166.31 PLATE 59

**DISTRIBUTION**: Kenya, India and Sri Lanka to Japan and Australia; may occur along coast of Mozambique. Attains 70 cm.

**MATERIAL**: 2/2 (4.4, 6.36 mm OD, 126, 222 mm TL), PEM 5986, 11297; locality unknown; Id. MJS.

**Otolith shape**: Oval to oblong. **Thickness**: Moderate. **Form**: - **Mesial** convex, - **Lateral** concave. **Dorsal margin**: Rounded; **sculpture**, irregular. **Ventral margin**: Rounded and irregular. **Posterior margin**: Sharply rounded and irregular. **Sulcus acusticus**: Ostial, heterosulcoid. **Colliculum**: Heteromorph, colliculi low, anterior, rugose. **Pseudocolliculum**: Absent. **Ostium**: Narrow and elongate. **Cauda**: Strongly flexed, recurved and deep at tip. **Ostio-caudal differentiation**: Dorso-ventrally constricted. **Ostium/cauda**: 1:1, 1:1.2. **Collum**: Absent, step to cauda. **Crista superior**: Well developed over ostium and caudal flexion, ridge-like over anterior cauda. **Crista inferior**: Poorly developed under ostium and ridge-like under cauda. **Dorsal depression**: Elongate, oval and deep. **Ventral depression**: Elongate under crista, no groove. **Rostrum**: Large, broad and rounded. **Antirostrum**: Small and pointed. **Excisura**: Moderate, notch shallow, if present, angle acute.

*Epinephelus albomarginatus*, SSF No. 166.33  
PLATE 59

**DISTRIBUTION**: Known only from southern Mozambique to East London. Attains 90 cm.

**MATERIAL**: 4/23 (8.4-23.0 mm OD, 173-804 mm TL), PEM 6545 (RUSI 19373), 0747, 6221, 6378; off Natal; Id. RvdE, MJS, PCH.

**Otolith shape**: Fusiform to oblong. **Thickness**: Moderate. **Form**: - **Mesial** convex, - **Lateral** concave. **Dorsal margin**: Slightly rounded; **sculpture**, slightly irregular. **Ventral margin**: Slightly rounded and sinuate or irregular. **Posterior margin**: Rounded or pointed, becoming irregular with growth. **Sulcus acusticus**: Ostial, heterosulcoid. **Colliculum**: Heteromorph, indistinct and barely raised. **Pseudocolliculum**: Absent. **Ostium**: Elongate, narrow. **Cauda**: Sinuous, flexed near tip. **Ostio-caudal differentiation**: Dorso-ventrally constricted. **Ostium/cauda**: 1:1.1, 1:1.2, 1:1.2, 1:1. **Collum**: Absent, step present. **Crista superior**: Well developed at extremes, ridge-like over cauda. **Crista inferior**: Poorly developed under ostium, well developed under cauda, becoming ridge-like under flexion. **Dorsal depression**: Shallow and wide depression above crista. **Ventral depression**: Shallow depression below cauda, deepest near tip. **Rostrum**: Large and sharply rounded. **Antirostrum**: Large and pointed, but small in juveniles. **Excisura**: Wide, notch variable, angle acute.

*Epinephelus andersoni*, SSF No. 166.34 PLATE 59

**DISTRIBUTION**: Known only from southern Mozambique to Knysna. Attains 80 cm.

**MATERIAL**: 5/38 (9.5-17.4 mm OD, 260-751 mm TL), PEM 8578 (RUSI 37472), 14821, 10353, 6336, 6218; Natal, Transkei and eastern Cape; Id. MJS, PCH.

**Otolith shape**: Oblong. **Thickness**: Moderate. **Form**: - **Mesial** convex, - **Lateral** concave. **Dorsal margin**: Slightly rounded; **sculpture**, serrate to irregular. **Ventral margin**: Slightly rounded and crenate to serrate. **Posterior margin**: Sharply rounded to pointed and irregular. **Sulcus acusticus**: Ostial, heterosulcoid. **Colliculum**: Heteromorph, low anterior, posterior may be very indistinct. **Pseudocolliculum**: Absent. **Ostium**: Narrow, ventral margin straight, crease at dorsal edge of ostium in large otoliths. **Cauda**: Sinuate and flexed, deeper and narrower at tip. **Ostio-caudal differentiation**: Dorso-ventrally constricted. **Ostium/cauda**:



1:1.4, 1:1.3, 1:1.2, 1:1, 1:1.3. **Collum:** Absent. **Crista superior:** Well developed over ostium, well developed to ridge-like (with separate crests) over cauda in large otoliths. **Crista inferior:** Well developed under ostium, becoming ridge-like towards posterior cauda. **Dorsal depression:** Elongate, follows cauda. **Ventral depression:** Along cauda to margin, groove near margin. **Rostrum:** Large and sharply rounded. **Antirostrum:** Large or small and pointed. **Excisura:** Wide, notch moderately deep, angle acute.

***Epinephelus chabaudi*, SSF No. 166.37 PLATE 60**

**DISTRIBUTION:** Known only from Knysna, north to Kenya. Attains 137 cm.

**MATERIAL:** 3/11 (10.5-20.4 mm OD, 245-755 mm TL), PEM 0173 (RUSI 03587), 10364, 8564; off Transkei and southeastern Cape; Id. GJBR, MJS.

**Otolith shape:** Approximately oblong. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded; **sculpture,** very irregular. **Ventral margin:** Very slightly rounded and irregular to very irregular. **Posterior margin:** Sharply rounded and lobed. **Sulcus acusticus:** Ostial, heterosulcoid, appears ventrally situated. **Colliculum:** Heteromorph, anterior colliculum slightly raised, may be nodular, posterior very low. **Pseudocolliculum:** Absent. **Ostium:** Elongate, ventral edge poorly defined. **Cauda:** Sinuous, slightly flexed near tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.6, 1:1.4, 1:1.3. **Collum:** Absent, small step present. **Crista superior:** Well developed over ostium, ridge-like from neck to flexion and very poorly developed at tip. **Crista inferior:** Poorly developed under ostium, well developed under anterior cauda, ridge-like to tip. **Dorsal depression:** Oval, shallow and broad, area broad in large otoliths (c. 20 mm OD). **Ventral depression:** Very shallow depression under cauda and caudal tip. **Rostrum:** Large and sharply rounded or pointed. **Antirostrum:** Absent or minute and sharply rounded. **Excisura:** Wide, notch absent or extremely shallow, angle wide.

***Epinephelus chlorostigma*, SSF No. 166.38 PLATE 60**

**DISTRIBUTION:** Red Sea and Indian Ocean (south to Natal) to western Pacific. Attains 75 cm.

**MATERIAL:** 3/7 (8.6-12.0 mm OD, 250-365 mm TL), PEM 6178, 2701, 6177; ORI and Sodwana; Id. JER, RvdE, MJS.

**Otolith shape:** Oblong. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded; **sculpture,** irregular. **Ventral margin:** Slightly rounded and irregular. **Posterior margin:** Rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph anterior colliculum low, posterior barely raised, if visible. **Pseudocolliculum:** Absent. **Ostium:** Moderately narrow, steep walls. **Cauda:** Sinuate, flexes near tip which may be open. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1, 1:1.4, 1:1.4. **Collum:** Absent, slight step to cauda. **Crista superior:** Well developed over ostium, ridge-like along cauda, poorly developed after flexion. **Crista inferior:** Well developed under sulcus, ridge-like under flexion. **Dorsal depression:** Oval and elongate. **Ventral depression:** Near tip of cauda, joins ventral groove. **Rostrum:** Large and sharply rounded. **Antirostrum:** Small and sharply rounded or absent. **Excisura:** Moderately wide, notch shallow, if present, angle wide.

***Epinephelus fasciatus*, SSF No. 166.39 PLATE 60**

**DISTRIBUTION:** Red Sea, southwards to Port Alfred and eastwards to the central Pacific. Attains 35 cm.

**MATERIAL:** 5/40 (6.1-9.54 mm OD, 177-252 mm TL, 2702 not measured), PEM 8532, 14570 (RUSI 31409), 14573, 14527 (RUSI 31438), 2702, [8400 (RUSI 37511), 8531 (RUSI 37512), 8197

(RUSI 37460)]; Sodwana Bay and Mauritius; Id. GJBR, MJS, PCH.

**Otolith shape:** Oblong. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded; **sculpture,** irregular. **Ventral margin:** Very slightly rounded and crenate. **Posterior margin:** Oblique and irregular. **Sulcus acusticus:** Ostial, may appear ostio-caudal, heterosulcoid. **Colliculum:** Heteromorph, anterior extremely low, posterior very indistinct. **Pseudocolliculum:** Absent. **Ostium:** Elongate and narrow, almost straight. **Cauda:** Straight then strongly flexed, tip not clearly closed. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.1, 1:1.3, 1:1.2, 1:1.1, 1:1. **Collum:** Absent, small step may be present. **Crista superior:** Well developed, ridge-like along cauda to flexion, poor after flexion. **Crista inferior:** Well developed under sulcus, ridge-like under flexion to tip. **Dorsal depression:** Narrow and elongate. **Ventral depression:** Under caudal flexion, joined by ventral groove/s. **Rostrum:** Large and sharply rounded. **Antirostrum:** Absent to minute and pointed. **Excisura:** Wide, notch shallow if present, angle varies.

***Epinephelus flavocaeruleus*, SSF No. 166.41 PLATE 60**

**DISTRIBUTION:** Indian Ocean from Kenya south to Port Alfred and east to India, Persian Gulf, Andaman Ids and East Burma Sea; also probably all tropical Indian Ocean Ids. Attains 90 cm.

**MATERIAL:** 3/3 (7.22-16.34 mm OD, 263-835 mm TL), PEM 15440 (RUSI 40609), 15072, 2850; Sodwana Bay, Cape Recife and ORI; Id. MJS, PCH.

**Otolith shape:** Oval (c. 7 mm OD) to oblong (c. 13 mm OD). **Thickness:** Moderate. **Form:** - Mesial very convex, - Lateral very concave. **Dorsal margin:** Rounded to lobed; **sculpture,** irregular to dentate or digitate. **Ventral margin:** Slightly rounded and serrate. **Posterior margin:** Rounded, becoming sharply rounded and irregular, becoming digitate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, both very low. **Pseudocolliculum:** Absent. **Ostium:** Wide but elongate, slightly sinuous ventral wall. **Cauda:** Sinuate, flexed at posterior. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.1, 1:1.2, 1:1.2. **Collum:** Absent but slight step to cauda. **Crista superior:** Well developed over ostium, ridge-like from neck to caudal flexion, well developed at tip. **Crista inferior:** Poorly developed under ostium, ridge-like under cauda. **Dorsal depression:** Oval from neck to flexion. **Ventral depression:** Present under cauda, groove may be present. **Rostrum:** Large and sharply rounded. **Antirostrum:** Absent or minute, becoming large and pointed. **Excisura:** Wide, notch shallow, angle acute.

***Epinephelus hexagonatus*, SSF No. 166.44 PLATE 60**

**DISTRIBUTION:** Tropical western Indian Ocean from Mozambique to Sri Lanka and east to the Marshall Ids and Japan. Attains 25 cm.

**MATERIAL:** 2/2 (7.5, 11.9 mm OD, 325, 515 mm TL), PEM 8534, 8547; Sodwana Bay; Id. PCH.

**Otolith shape:** Oval becoming oblong, almost fusiform. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Rounded; **sculpture,** crenate or lobed. **Ventral margin:** Slightly rounded and crenate. **Posterior margin:** Pointed, irregular or crenate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, both extremely low and indistinct. **Pseudocolliculum:** Absent. **Ostium:** Flares, deeper than cauda, step V-shaped. **Cauda:** Straight, tip flexed and deep. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:0.9, 8547 broken. **Collum:** Absent, slight step up to cauda. **Crista superior:** Well developed over entire sulcus. **Crista inferior:** Well developed under entire sulcus, ridge-like under flexion, may extend along entire cauda in large otoliths.



**Dorsal depression:** Elongate. **Ventral depression:** Shallow near caudal flexion; shallow, wide groove joins depression. **Rostrum:** Short, becoming large and elongate with growth. **Antirostrum:** Small becoming large and pointed with growth. **Excisura:** Moderate to wide, notch shallow to deep, angle acute.

*Epinephelus lanceolatus*, SSF No. 166.45 PLATE 61

**DISTRIBUTION:** Tropical Indo-Pacific south to Algoa Bay. Attains 270 cm, 400+ kg.

**MATERIAL:** 2/2 (5.1, 17.8 mm OD, 9328 = 122mm TL, 0077 = c. 100kg, TL not recorded), PEM 9328, 0077; PEO, Swartkops estuary; Id. GJBR, MJS.

**Otolith shape:** Oblong as juvenile, approximately oval in large otoliths (17.8 mm OD). **Thickness:** Moderate, thickening with growth. **Form:** - Mesial convex to very convex in adults, - Lateral very concave. **Dorsal margin:** Rounded; **sculpture,** irregular. **Ventral margin:** Slightly rounded and irregular. **Posterior margin:** Sharply rounded and irregular, crenate in juveniles. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior low, posterior extremely indistinct. **Pseudocolliculum:** Absent. **Ostium:** Elongate in juvenile, becoming wide and bell-shaped in large otoliths. **Cauda:** Slightly sinuate, flexed at tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.3, 1:1.3. **Collum:** Absent, slight step or rise to cauda. **Crista superior:** Well developed over ostium and caudal flexion, ridge-like over cauda to flexion. **Crista inferior:** Poorly developed under ostium, well developed under cauda but ridge-like under caudal flexion. **Dorsal depression:** Oval in juveniles, poor or absent in large otoliths. **Ventral depression:** Elongate depression below cauda, groove present near margin. **Rostrum:** Large and blunt. **Antirostrum:** Absent in juveniles, becoming large and pointed (17.8 mm OD). **Excisura:** Moderate, notch shallow, angle acute.

*Epinephelus longispinis*, SSF No. 166.46 PLATE 61

**DISTRIBUTION:** Indian Ocean from the Transkei to Indonesia. Attains 55 cm.

**MATERIAL:** 2/2 (10.5, 10.76 mm OD, 405, 380 mm TL), PEM 5671, 15769; Sodwana Bay, Comoro Ids; Id. PCH.

**Otolith shape:** Oval. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded; **sculpture,** crenate. **Ventral margin:** Slightly rounded and crenate. **Posterior margin:** Oblique and dentate to irregular digitate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, both low and indistinct. **Pseudocolliculum:** Absent. **Ostium:** Elongate and narrow, slight dorsal flare, ventral wall straight. **Cauda:** Deep at angular flexion. **Ostio-caudal differentiation:** Slight dorsal and ventral constrictions. **Ostium/cauda:** 1:1.2, 1:1.2. **Collum:** Absent, no step. **Crista superior:** Well developed at extremes, low ridge along anterior cauda. **Crista inferior:** Well developed under ostium and cauda, ridge-like from flexion to tip, wall steep at flexion. **Dorsal depression:** Elongate. **Ventral depression:** Under cauda, near margin, deepens posteriorly. **Rostrum:** Large and sharply rounded. **Antirostrum:** Small or minute and pointed. **Excisura:** Moderate, notch shallow, angle wide.

*Epinephelus macrospilos* (misnamed *E. faveatus* in SSF),  
SSF No. 166.40 PLATE 61

**DISTRIBUTION:** Western Indian Ocean to Natal and east to Indonesia. Attains 51 cm.

**MATERIAL:** 2/2 (10.52, 10.72 mm OD, TL not recorded), PEM 2704, 2780; Sodwana Bay; Id. JER.

**Otolith shape:** Oblong to fusiform. **Thickness:** Moderate to thick. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly raised; **sculpture,** irregular and notched. **Ventral mar-**

**gin:** Very slightly rounded and serrate. **Posterior margin:** Pointed and crenate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior low, margin of posterior visible, deeply incised in centre. **Pseudocolliculum:** Absent. **Ostium:** Wide, walls irregular. **Cauda:** Sinuous, deep, slightly flexed, dorsal caudal wall slopes. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:0.9, 1:1.1. **Collum:** Absent. **Crista superior:** Well developed along entire sulcus, poor at tip. **Crista inferior:** Well developed under ostium, high ridge under cauda to tip. **Dorsal depression:** Irregular and shallow, area uneven. **Ventral depression:** Elongate along entire cauda, joins ventral groove causing ridging in ventral area. **Rostrum:** Large and elongate, sharply rounded. **Antirostrum:** Large and pointed. **Excisura:** Wide, notch shallow, angle wide.

*Epinephelus marginatus* (previously *E. guaza* in SSF)  
SSF No. 166.43 PLATE 61

**DISTRIBUTION:** Mediterranean and eastern Atlantic south to the Cape and into the Indian Ocean, at least to Quissico, Mozambique (25°S). Also reported from Brazil. Attains 150 cm.

**MATERIAL:** 5/47 (4.85-18.0 mm OD, 136-755 mm TL), PEM 2535, 6036, 15480 (RUSI 40597), 5731, 6381; northern Natal to southern Cape; Id. MJS, PCH.

**Otolith shape:** Oblong to fusiform. **Thickness:** Moderate, thickens with growth. **Form:** - Mesial convex, - Lateral very concave. **Dorsal margin:** Slightly rounded; **sculpture,** irregular to lobed. **Ventral margin:** Slightly rounded and irregular. **Posterior margin:** Pointed and dentate. **Sulcus acusticus:** Ostial, may appear ostio-caudal, heterosulcoid. **Colliculum:** Heteromorph, extremely low and indistinct. **Pseudocolliculum:** Absent. **Ostium:** Elongate, widening with growth. **Cauda:** Long, slightly sinuous. Flexed tip parallel to posterior wall, tip may open into ventral groove. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.1, 1:1.1, 1:1.3, 1:1, 1:1. **Collum:** Absent, slight step to cauda. **Crista superior:** Well developed along sulcus, may be ridge-like over anterior cauda. **Crista inferior:** Well developed under sulcus, ridge-like after flexion. **Dorsal depression:** Shallow from ostium to flexion. **Ventral depression:** Distinct and elongate under caudal flexion, groove may be present near ventral margin. **Rostrum:** Large and sharply rounded, becoming narrow and elongate with growth. **Antirostrum:** Small and pointed or minute. **Excisura:** Wide, notch shallow, angle acute to wide.

*Epinephelus melanostigma*, SSF No. 166.49 PLATE 61

**DISTRIBUTION:** Western Indian Ocean south to Durban and East to the western Central Pacific. Attains 30 cm.

**MATERIAL:** 1/1 (9.82 mm OD, 329 mm TL), PEM 15399 (RUSI 40602); Madagascar or Bazaruto; Id. MJS, PCH.

**Otolith shape:** Oblong. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Approximately horizontal; **sculpture,** crenate. **Ventral margin:** Slightly rounded, almost parallel to dorsal margin, crenate to serrate. **Posterior margin:** Oblique and crenate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior low, posterior indistinct. **Pseudocolliculum:** Absent. **Ostium:** Elongate, broad, mainly on rostrum. **Cauda:** Straight, sharply flexed, tip indistinct. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.2. **Collum:** Absent. **Crista superior:** Well developed over ostium and cauda, poor at tip. **Crista inferior:** Poorly developed under anterior ostium, well developed elsewhere, ridge-like from flexion. **Dorsal depression:** Absent, but groove through crista at flexion. **Ventral depression:** Complex, penetrates crista at neck, elongate under cauda, joins depressed margin. **Rostrum:** Elongate, broad and rounded. **Antirostrum:** Small and pointed. **Excisura:** Wide, notch shallow, angle acute.



***Epinephelus merra*, SSF No. 166.50 PLATE 61**

**DISTRIBUTION:** Indo-West Pacific south to the Transkei, east to French Polynesia and north to Japan. Attains 30 cm.

**MATERIAL:** 1/1 (10.2 mm OD, 495 mm TL), PEM 14574; Mauritius; Id. MJS.

**Otolith shape:** Fusiform. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly raised and indented; **sculpture**, irregular. **Ventral margin:** Straight to slightly rounded, notched under caudal tip and serrate. **Posterior margin:** Pointed and irregular to dentate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior low, posterior very indistinct. **Pseudocolliculum:** Absent. **Ostium:** Elongate, slight ventral bulge anterior to neck, fairly deep and irregular floor. **Cauda:** Straight, slightly flexed over ventral notch, ventral wall vertical. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:0.9. **Collum:** Absent, slight step up to cauda. **Crista superior:** Well developed along sulcus. **Crista inferior:** Poorly developed under ostium, ridge-like elsewhere. **Dorsal depression:** Shallow and oval. **Ventral depression:** Elongate from tip of cauda to neck, ventral groove joins posteriorly. **Rostrum:** Large and sharply rounded. **Antirostrum:** Large and pointed. **Excisura:** Moderately wide, notch shallow, angle wide.

***Epinephelus morrhua*, SSF No. 166.53 PLATE 61**

**DISTRIBUTION:** Red Sea south to Durban and east to Japan and New Caledonia. Attains 90 cm.

**MATERIAL:** 4/5 (8.7-17.8 mm OD, 163-520 mm SL), PEM 7716 (RUSI 20109), 15614, 15603, 1584H; Kenya, Comoro Ids, Mozambique; Id. PCH.

**Otolith shape:** Approximately oval in juvenile, fusiform in large (17.8 mm OD). **Thickness:** Moderate. **Form:** - Mesial flat to slightly convex, - Lateral slightly concave becoming more concave with growth. **Dorsal margin:** Fairly straight to slightly rounded; **sculpture**, irregular to dentate. **Ventral margin:** Slightly rounded and irregular. **Posterior margin:** Bluntly rounded and irregular. **Sulcus acusticus:** Ostial, may appear ostio-caudal as tip not distinctly closed, heterosulcoid. **Colliculum:** Heteromorph, both low, indistinct in juveniles. **Pseudocolliculum:** Absent. **Ostium:** Elongate. **Cauda:** Straight section short, flex short in adult, tip not closed. **Ostio-caudal differentiation:** Slight dorso-ventral constrictions. **Ostium/cauda:** 1:1.4, 1:1.2, 1:1.2, 1:1.2. **Collum:** Absent, step may be present in small otoliths. **Crista superior:** Well developed over ostium, low ridge over cauda in juveniles, well developed in large otoliths. **Crista inferior:** Poor or well developed under ostium, well developed along cauda, ridge-like after flexion. **Dorsal depression:** Elongate from flexion to ostium, broadening with growth. **Ventral depression:** Below flexion joined under caudal tip by groove from margin. **Rostrum:** Large and sharply rounded. **Antirostrum:** Absent or minute and pointed. **Excisura:** Wide, notch absent or shallow, angle wide.

***Epinephelus rivulatus*, SSF No. 166.60 PLATE 62**

**DISTRIBUTION:** Widely distributed in western Indian Ocean from Algoa Bay to India and east to China and Japan. Attains 35 cm.

**MATERIAL:** 3/45 (7.7-10.6 mm OD, 237-325 mm TL), PEM 6162 (RUSI 17176), 6732, 6304, [8874 (RUSI 37496), 8826 (RUSI 37420)]; Port Durnford, Durban and Mozambique; Id. MJS, PCH.

**Otolith shape:** Approximately fusiform to oblong. **Thickness:** Moderate to thick in larger fish. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Rounded or slightly raised; **sculpture**, crenate or irregular. **Ventral margin:** Slightly rounded and irregu-

lar. **Posterior margin:** Sharply rounded or blunt and irregular. **Sulcus acusticus:** Ostial, large may appear ostio-caudal, heterosulcoid. **Colliculum:** Heteromorph, both very low and indistinct. **Pseudocolliculum:** Absent. **Ostium:** Elongate and approximately straight. **Cauda:** Sinuate, gently flexed, tip not closed. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1, 1:1, 1:1.1. **Collum:** Absent, small step may be present. **Crista superior:** Well developed at extremes, ridge-like along anterior cauda, absent at tip. **Crista inferior:** Poorly developed under ostium, well developed under cauda to ridge-like under flexion. **Dorsal depression:** Elongate above cauda. **Ventral depression:** Present near flexion, joins tip. Deep and wide groove at margin. **Rostrum:** Large and sharply rounded. **Antirostrum:** Small and pointed. **Excisura:** Wide, notch shallow, angle acute.

***Epinephelus spilotoceps*, SSF No. 166.63 PLATE 62**

**DISTRIBUTION:** Western Indian Ocean from Natal to Kenya, also Madagascar, Comoro Ids, Seychelles, Mauritius and Reunion; in the western Pacific from the Marshall Ids to the Line Ids. Attains 35 cm.

**MATERIAL:** 2/2 (4.4, 5.0 mm OD, 114, 141 mm TL), PEM 14545 (RUSI 31388), 14544 (RUSI 31382); Mauritius; Id. MJS, PCH.

**Otolith shape:** Oblong. **Thickness:** Moderate, thickens in large otoliths. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Slightly rounded; **sculpture**, irregular. **Ventral margin:** Slightly rounded, notch under caudal tip and sculpture slightly irregular. **Posterior margin:** Sharply rounded and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Flared and widens slightly anteriorly. **Cauda:** Approximately straight till strong flexion. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.2, 1:1. **Collum:** Absent, no step. **Crista superior:** Well developed along sulcus, ridge-like in mid-cauda, absent at tip. **Crista inferior:** Poorly developed under ostium, well developed under cauda, ridge-like after flexion. **Dorsal depression:** Oval over mid-cauda. **Ventral depression:** Deep depression under flexion, deep ventral groove. **Rostrum:** Broad and bluntly rounded. **Antirostrum:** Small and pointed. **Excisura:** Moderate, notch shallow, angle wide.

***Epinephelus tauvina*, SSF No. 166.65 PLATE 62**

**DISTRIBUTION:** Red Sea to Natal, thence to India across the central Pacific to the Pitcairn group. Attains 70 cm.

**MATERIAL:** 1/1 (8.7 mm OD, 343 mm TL), PEM 15682 (RUSI 41959); Red Sea; Id. PCH.

**Otolith shape:** Oblong. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Approximately flat; **sculpture**, crenate to irregular. **Ventral margin:** Slightly rounded, notch under caudal tip; slightly irregular. **Posterior margin:** Oblique, ventral corner sharply rounded; irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Moderately elongate. **Cauda:** Approximately straight till flexed tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted, mainly ventral. **Ostium/cauda:** 1:1. **Collum:** Absent, no step. **Crista superior:** Well developed along sulcus, ridge-like in mid-cauda, absent at tip. **Crista inferior:** Poorly developed under ostium, well developed under cauda, ridge-like after flexion. **Dorsal depression:** Elongate from neck to flexion. **Ventral depression:** Deep depression under flexion, joins ventral groove. **Rostrum:** Moderate, sharply rounded. **Antirostrum:** Small and pointed. **Excisura:** Moderate, notch shallow, angle wide.



***Epinephelus tukula*, SSF No. 166.66 PLATE 62**

**DISTRIBUTION:** Indo-West Pacific from Natal to Japan and Australia. Attains 200 cm, 100 kg.

**MATERIAL:** 1/1 (7.1 mm OD, 245 mm TL), PEM 8813 (RUSI 37483); Kosi Bay; Id. PCH.

**Otolith shape:** Approximately oblong. **Thickness:** Moderate. **Form:** - **Mesial** slightly convex, - **Lateral** concave. **Dorsal margin:** Slightly rounded; **sculpture**, dentate to irregular. **Ventral margin:** Slightly rounded and irregular to crenate. **Posterior margin:** Sharply rounded and irregular. **Sulcus acusticus:** Ostial, may appear ostio-caudal, heterosulcoid. **Colliculum:** Heteromorph, low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Elongate and narrow. **Cauda:** Straight over most of length, tip strongly flexed and not distinctly closed, ends close to margin. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.1. **Collum:** Absent, small step up to cauda. **Crista superior:** Well developed, absent at tip. **Crista inferior:** Well developed becoming ridge-like under flexion. **Dorsal depression:** Absent, area irregular. **Ventral depression:** Present under flexion, shallow groove below cauda. **Rostrum:** Large, elongate and sharply rounded. **Antirostrum:** Large and pointed. **Excisura:** Wide, notch moderately shallow, angle acute.

***Plectropomus* sp. (identified as *P. maculatum*),  
SSF No. 166.— PLATE 62**

**DISTRIBUTION:** Tropical. Some species attain at least 100cm.

**MATERIAL:** 1/1 (8.78 mm OD, 468 mm TL), 1347H; Eilat; Id. AD.

**Otolith shape:** Oblong. **Thickness:** Moderate. **Form:** - **Mesial** slightly convex, - **Lateral** slightly concave. **Dorsal margin:** Slightly rounded; **sculpture**, irregular. **Ventral margin:** Very slightly rounded and irregular. **Posterior margin:** Sharply rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Flares widely dorsally, ventral wall very poorly defined. **Cauda:** Straight, flexed near tip, distinctly closed. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.2. **Collum:** Absent, marked step up to cauda. **Crista superior:** Well developed over ostium and at caudal tip, ridge-like along cauda. **Crista inferior:** Poorly developed under ostium, ridge-like under cauda, broad ridge under flexion, narrowing to tip. **Dorsal depression:** Wide and shallow over most of dorsal area. **Ventral depression:** Lower 2/3rds of ventral area depressed. **Rostrum:** Large, broad and rounded. **Antirostrum:** Minute to absent. **Excisura:** Wide, notch very shallow, angle wide.

***Variola albinmarginata*, SSF No. 166.74 PLATE 62**

**DISTRIBUTION:** Zanzibar, Mafia Id, Madagascar, Mascarenes, Chagos and western Pacific. Attains 60 cm FL.

**MATERIAL:** 1/1 (9.82 mm OD, 370 mm TL), PEM 15674; Comoro Ids; Id. PCH, lodged in JLBSII.

**Otolith shape:** Oblong. **Thickness:** Moderate. **Form:** - **Mesial** convex, - **Lateral** concave. **Dorsal margin:** Rounded; **sculpture**, notched or slightly irregular. **Ventral margin:** Slightly rounded and crenate to irregular. **Posterior margin:** Rounded and irregular, notched or digitate posteriorly. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Wide. **Cauda:** Narrow, deep and approximately straight then roundly flexed. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.3. **Collum:** Absent, no step. **Crista superior:** Low ridge over anterior cauda, well developed elsewhere. **Crista inferior:** Well developed, ridge-like under flexion. **Dorsal**

**depression:** Shallow and elongate. **Ventral depression:** Shallow at caudal tip, indistinct groove near margin. **Rostrum:** Large and angularly blunt. **Antirostrum:** Small and pointed. **Excisura:** Moderate, notch moderately shallow, angle acute.

***Variola louti*, SSF No. 166.75 PLATE 62**

**DISTRIBUTION:** From Red Sea south to Durban and east to the Pitcairn Group. Attains 80 cm FL.

**MATERIAL:** 4/11 (6.7-11.3 mm OD, 215-645 mm TL), PEM 8545, 8158, 8386, 8374; Kosi Bay; Id. MJS.

**Otolith shape:** Oblong. **Thickness:** Moderate. **Form:** - **Mesial** convex, - **Lateral** concave. **Dorsal margin:** Rounded; **sculpture**, notched or irregular. **Ventral margin:** Slightly rounded and crenate to irregular. **Posterior margin:** Rounded and irregular, eroding with growth. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Wide and deep. **Cauda:** Deep and approximately straight until distal flexion. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.3, 1:1, 1:1.1, 1:1.1. **Collum:** Absent, step present. **Crista superior:** Well developed, low ridge over cauda in juveniles. **Crista inferior:** Well developed, ridge-like under flexion. **Dorsal depression:** Shallow and elongate in juveniles, area notched in adults. **Ventral depression:** Shallow at caudal tip, deepening with growth, ventral groove in large otoliths (c. 11 mm OD). **Rostrum:** Large and sharply rounded. **Antirostrum:** Usually small and pointed. **Excisura:** Moderate, notch shallow, angle varies.

***Serranus cabrilla*, SSF No. 166.76 PLATE 62**

**DISTRIBUTION:** Mediterranean and eastern Atlantic from the English Channel to South Africa and round this coast to Natal. Attains 30 cm.

**MATERIAL:** 4/10 (3.35-7.8 mm OD, 83-217 mm TL), PEM 5627, 6546, 15008 (RUSI 35582), 0476; Cape south coast; Id. MJS, PCH, GJBR.

**Otolith shape:** Oblong to fusiform. **Thickness:** Moderate. **Form:** - **Mesial** slightly convex, - **Lateral** concave. **Dorsal margin:** Slightly rounded; **sculpture**, slightly lobed. **Ventral margin:** Slightly rounded and irregular to crenate. **Posterior margin:** Sharply rounded or blunt and irregular. **Sulcus acusticus:** Ostial, may appear ostio-caudal in large otoliths, heterosulcoid. **Colliculum:** Heteromorph with anterior colliculum slightly raised, posterior indistinct. **Pseudocolliculum:** Absent. **Ostium:** Narrow and elongate. **Cauda:** Straight then gently flexed at tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:0.8, 1:0.8, 1:1.1, 1:1. **Collum:** Absent, step may be present. **Crista superior:** Poorly developed over ostium and caudal tip, narrow ridge over cauda, absent at tip. **Crista inferior:** Moderately well developed under ostium, well developed under cauda. **Dorsal depression:** Oval and elongate. **Ventral depression:** Absent, distinct groove in large otoliths, absent in small. **Rostrum:** Large and sharply rounded. **Antirostrum:** Absent or small and pointed. **Excisura:** Moderately wide, notch absent or very shallow with acute angle.

**SERRANIDAE Nelson No. 284  
(CALLANTHIIDAE in SSF)**

**Family characteristics:** A single species available. Otolith oval, crenate to irregular and dentate, heterosulcoid with ostial opening, up to 9 mm OD. Heteromorph, anterior colliculum low, posterior very low. Cauda with slight flexion at tip with distinct, ridge-like crista superior.



*Callanthias legras*, SSF No. 168.1 PLATE 63

**DISTRIBUTION:** Known only from Dassen Is. (off western Cape) to Natal. Attains 25 cm.

**MATERIAL:** 4/15 (5.7-9.0 mm OD, 171-295 mm TL), PEM 14436, 14432 (RUSI 28355), 12546 (RUSI 28356), 14433, [15365 (RUSI 38213)]; Cape south coast; Id. MJS, PCH.

**Otolith shape:** Oval. **Thickness:** Moderately thick. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Slightly rounded; **sculpture**, irregular with crenations. **Ventral margin:** Rounded and crenate to dentate. **Posterior margin:** Rounded to slightly rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior colliculum may be slightly raised at ventral margin, depressed in centre; posterior very low. **Pseudocolliculum:** Absent. **Ostium:** Fairly wide and deep, colliculum may be irregular and protrude through excisura. **Cauda:** Deep, slight flexion at tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1, 1:1.1, 1:1.1, 1:1. **Collum:** Absent but distinct step up to cauda in large otoliths. **Crista superior:** Poor to moderately well developed over ostium, distinct ridge over cauda, poor at tip. **Crista inferior:** Well developed under entire sulcus. **Dorsal depression:** Wide and shallow over most of dorsal area. **Ventral depression:** Absent, area smooth, becoming rough ventrally. **Rostrum:** Large and blunt to sharply rounded. **Antirostrum:** Small and blunt to pointed. **Excisura:** Moderate, notch shallow, angle acute.

**SERRANIDAE Nelson No. 284**  
**(DINOPERCIDAE in SSF)**

**Family characteristics:** Only a single species. Otoliths oval to oblong, measured up to 15.2 mm OD, heterosulcoid with ostial openings, cauda flexed and distinctly closed. Heteromorph, low anterior and indistinct posterior colliculum. Ostium wide with anterior dorsal margin flared or retroflexed.

*Dinoperca petersi*, SSF No. 180.1 PLATE 63

**DISTRIBUTION:** Uncertain, apparently common in Pakistan and South Africa (from Natal to Algoa Bay). Also reported from Kenya and Mozambique. Attains 62 cm.

**MATERIAL:** 5/30 (7.2-15.22 mm OD, 165-483 mm TL), PEM 8735, 11990, 8579, 15155, 6733; Durban and Cape Recife; Id. MJS, PCH.

**Otolith shape:** Oval becoming oblong with growth. **Thickness:** Moderate. **Form:** - Mesial strongly convex, - Lateral strongly concave. **Dorsal margin:** Slightly rounded and indented; **sculpture**, slightly irregular. **Ventral margin:** Rounded, entire anteriorly, crenate or irregular posteriorly. **Posterior margin:** Rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior colliculum slightly raised; posterior extremely low. **Pseudocolliculum:** Absent. **Ostium:** Wide and oval to rounded, dorsal margin flared or with retroflexion. **Cauda:** Approximately straight with short, sharp flexion at tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:0.9, 1:1.1, 1:1, 1:1.1, 1:1. **Collum:** Absent, step absent. **Crista superior:** Poor over anterior ostium, well developed over posterior ostium and cauda. **Crista inferior:** Poorly developed under anterior ostium, well developed elsewhere. **Dorsal depression:** Very shallow. **Ventral depression:** Shallow depression/groove below and anterior to caudal tip. **Rostrum:** Large and bluntly rounded. **Antirostrum:** Small and pointed. **Excisura:** Moderate, notch shallow, angle acute.

**GRAMMISTIDAE Nelson No. 285**

**Family characteristics:** Two species available. Otoliths oval or fusiform, small, up to c. 8.3 mm OD, heterosulcoid, ostial opening. Heteromorph.

**Key**

- 1a. Otolith fusiform; ostium elongate;  
cauda long and straight; colliculi indistinct . . . . .  
. . . . . *Aulacocephalus temmincki* 167.1
- 1b. Otolith oval; ostium broad; cauda gently flexed  
but short; colliculi usually distinct . . . . .  
. . . . . *Grammistes sexlineatus* 167.3

*Aulacocephalus temmincki*, SSF No. 167.1 PLATE 63

**DISTRIBUTION:** Wide-spread in the Indo-Pacific: Natal (south to Durban), Japan, Korea, north eastern China, Taiwan, Mauritius, Reunion, Thailand, Kermadec Ids and New Zealand. Attains 35 cm.

**MATERIAL:** 3/3 (6.68-8.22 mm OD, 216-c. 350 mm TL), PEM 15469 (RUSI 40596), 5984, 0616; Durban fish market and Umhlanga; Id. PCH, MJS, GJBR.

**Otolith shape:** Fusiform. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Slightly rounded; **sculpture**, crenate to dentate. **Ventral margin:** Slightly rounded and irregular. **Posterior margin:** Sharply rounded and irregular to dentate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, indistinct anterior and posterior colliculi, ventral margins slightly raised. **Pseudocolliculum:** Absent. **Ostium:** Elongate, ventral margin approximately straight and dorsal margin flared slightly. **Cauda:** Approximately straight and flared at tip. **Ostio-caudal differentiation:** Slight dorso-ventral constriction. **Ostium/cauda:** 1:0.9, 1:1.2, 1:1.1. **Collum:** Absent, distinct step up to cauda. **Crista superior:** Well developed along entire length of sulcus, tip may have groove from dorsal area. **Crista inferior:** Moderately well developed under ostium, ridge-like under cauda. **Dorsal depression:** Absent, area rough. **Ventral depression:** Shallow and parallel to crista, shallow groove near margin from ostium to caudal tip. **Rostrum:** Elongate and sharply rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Wide, notch shallow, angle wide.

*Grammistes sexlineatus*, SSF No. 167.3 PLATE 63

**DISTRIBUTION:** Indo-West Pacific and Red Sea; on our coast south to East London. Attains 27 cm.

**MATERIAL:** 5/11 (1.9-4.45 mm OD, 37-185 mm TL), PEM 14281, 8413 (RUSI 34117), 5979, 8348, 0023; east coast of South Africa and Comoro Ids; Id. PCH, MJS, GJBR.

**Otolith shape:** Approximately oval. **Thickness:** Thick, especially centre. **Form:** - Mesial slightly convex, - Lateral slightly convex. **Dorsal margin:** Rounded; **sculpture**, slightly irregular to crenate. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Rounded to blunt and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior colliculum distinct but low and rugose, filling entire ostium, posterior distinct but low. **Pseudocolliculum:** Absent. **Ostium:** Oval, slight flare dorsally. **Cauda:** Short, gently flexed along entire length. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:0.8, 1:0.7, 1:0.8, 1:0.7, (0023 damaged). **Collum:** Absent, no distinct step. **Crista superior:** Well developed over anterior ostium, ridge-like from posterior ostium along cauda, well developed at caudal tip. **Crista inferior:** Well developed to ridge-like below ostium, well developed elsewhere. **Dorsal depression:** Oval and deep. **Ventral depression:** Crescent-shaped depression or broad groove from ostium to caudal tip close to margin. **Rostrum:** Broad and sharply rounded or pointed. **Antirostrum:** Absent or small and rounded. **Excisura:** Moderate, notch, if present, very shallow, angle wide.



**GRAMMISTIDAE Nelson No. 285**  
(PSEUDOGRAMMIDAE in SSF)

**Family characteristics:** Two species available. Otoliths oval or approximately fusiform, up to c. 4 mm OD. Heterosulcoid, opening ostial, cauda short and straight. Heteromorph with anterior colliculum indented and more distinct than posterior. Ventral groove close to margin distinct.

**Key**

- 1a. Otolith oval; ostium elongate oval, slightly bulbous ventrally; rostrum short, broad and sharply rounded; dorsal depression shallow . . . . . *Aporops allfreei* 171.1
- 1b. Otolith approximately fusiform; ostium flares anteriorly; rostrum large and sharply rounded; dorsal depression deep . . . . . *Pseudogramma polyacantha* 171.2

***Aporops allfreei*, SSF No. 171.1 PLATE 63**

**DISTRIBUTION:** From Kenya (4°43'S) to Sodwana Bay. Attains 10 cm.

**MATERIAL:** 1/1 (4.0 mm OD, 92 mm TL), PEM 14270 (RUSI 31128); Comoro Ids; Id. PCH.

**Otolith shape:** Oval. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral flat. **Dorsal margin:** Slightly rounded; **sculpture**, slightly irregular. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Sharply rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low anterior colliculum indented, very low posterior colliculum may be present. **Pseudocolliculum:** Absent. **Ostium:** Oval, narrowing anteriorly, slightly bulbous postero-ventrally. **Cauda:** Almost straight, angled ventrally, tip rounded. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:0.8. **Collum:** Absent, no step. **Crista superior:** Well developed along entire length. **Crista inferior:** Moderately well developed along entire sulcus. **Dorsal depression:** Shallow, approximately oval. **Ventral depression:** Absent, groove along entire margin. **Rostrum:** Short, broad and sharply rounded. **Antirostrum:** Minute to absent. **Excisura:** Moderate, notch very shallow, angle very wide.

***Pseudogramma polyacantha*, SSF No. 171.2 PLATE 63**

**DISTRIBUTION:** Indo-Pacific, from Africa to Polynesia and Hawaii, south to Sodwana Bay. Attains 70 mm.

**MATERIAL:** 3/3 (2.35, 2.4 mm OD (4405 broken), 37-50 mm TL), PEM 4405, 2770, 2854; Sodwana Bay and Ledsman Shoal; Id. JER, MJS, PCH.

**Otolith shape:** Approximately fusiform. **Thickness:** Moderately thick. **Form:** - Mesial flat to slightly convex, - Lateral slightly convex. **Dorsal margin:** Rounded; **sculpture**, slightly irregular. **Ventral margin:** Rounded and approximately entire. **Posterior margin:** Pointed and entire. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior colliculum with low margins, depressed in centre; posterior, very indistinct. **Pseudocolliculum:** Absent. **Ostium:** Flared dorsally. **Cauda:** Short, broad and straight, indistinctly closed at tip. **Ostio-caudal differentiation:** Slight ventral constriction. **Ostium/cauda:** 1:1, 1:1, 1:0.8. **Collum:** Absent, no step. **Crista superior:** Ridge-like along entire sulcus, except tip poorly developed. **Crista inferior:** Moderately well developed along entire sulcus. **Dorsal depression:** Deep and oval. **Ventral depression:** Absent, groove at margin widening on rostrum, groove branches anterior to caudal tip. **Rostrum:** Large and sharply rounded. **Antirostrum:** Minute and rounded. **Excisura:** Moderate, notch shallow, angle wide.

**PSEUDOCHROMIDAE Nelson No. 286**

**Family characteristics:** Two species available. Otoliths oblong and small up to c. 2.5 mm OD, heterosulcoid, either ostio-caudal or ostial which may appear ostio-caudal. Heteromorph, low anterior, indistinct posterior colliculum. Dorsal area reduced and indented.

**Key**

- 1a. Otolith oblong; cauda elongate; sulcus opening ostio-caudal . . . . . *Pseudochromis dutoiti* 169.4
- 1b. Otolith oblong and relatively broad; cauda short; sulcus opening ostial but may appear ostio-caudal . . . . . *Pseudochromis melas* 169.5

***Pseudochromis dutoiti*, SSF No. 169.4 PLATE 64**

**DISTRIBUTION:** Indian Ocean from Pakistan and Persian Gulf to Durban. Attains 88 mm.

**MATERIAL:** 4/5 (2.0-2.15 mm OD, 57-71 mm TL), PEM 2858, 0757H, 0696H, 0695H; Sodwana Bay; Id. TH, GJBR.

**Otolith shape:** Oblong. **Thickness:** Moderately thick. **Dorsal margin:** Slightly rounded; **sculpture**, approximately entire. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Sharply rounded and slightly irregular. **Sulcus acusticus:** Ostio-caudal, heterosulcoid. **Colliculum:** Heteromorph, anterior and posterior colliculi low and indistinct. **Pseudocolliculum:** Absent. **Ostium:** Small, flares dorsally. **Cauda:** Long with gentle curve along entire length, open to ventral margin. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.3, 1:1.4, 1:1.5, 1:1.9. **Collum:** Absent, step up to cauda. **Crista superior:** Moderately well developed over ostium and posterior cauda, ridge-like over anterior cauda. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Oval above ridge. **Ventral depression:** Absent, groove broad and shallow near margin. **Rostrum:** Moderate and sharply rounded. **Antirostrum:** Minute to small and rounded. **Excisura:** Moderate, notch shallow, angle varies. **Form:** - Mesial very slightly convex, - Lateral very slightly concave.

***Pseudochromis melas*, SSF No. 169.5 PLATE 64**

**DISTRIBUTION:** Known from Kenya and Sodwana Bay. Attains 90 mm.

**MATERIAL:** 1/1 (2.45 mm OD, 86 mm TL), PEM 4617; Ledsman Shoal; Id. PCH.

**Otolith shape:** Oblong. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral slightly concave. **Dorsal margin:** Rounded; **sculpture**, slightly irregular. **Ventral margin:** Slightly rounded and irregular to crenate. **Posterior margin:** Sharply rounded and approximately entire. **Sulcus acusticus:** Ostial, may appear ostio-caudal as tip not distinctly closed, heterosulcoid. **Colliculum:** Heteromorph with low anterior colliculum, posterior indistinct. **Pseudocolliculum:** Absent. **Ostium:** Short, flared dorsally. **Cauda:** Straight and slightly flexed posteriorly. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.4. **Collum:** Absent, slight step to cauda. **Crista superior:** Very poor over anterior ostium, ridge-like over posterior ostium and cauda, poor to absent at caudal tip. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Oval and moderately deep. **Ventral depression:** Shallow in mid-ventral region. **Rostrum:** Broad and sharply rounded. **Antirostrum:** Minute to absent. **Excisura:** Moderate, notch very shallow, angle wide.



## PLESIOPIDAE Nelson No. 288

**Characteristics of the family:** Based on single species; otoliths up to at least 4.4 mm OD and moderately thick, heterosulcoid with ostial opening, cauda flexed at tip. Heteromorph.

### *Callopleiops altivelis*, SSF No. 172.1 PLATE 64

**DISTRIBUTION:** Widespread in tropical Indo-Pacific; reported from northern Mozambique and the Red Sea. Attains 16 cm.

**MATERIAL:** 1/1 (4.35 mm OD, 74 mm SL), PEM 15636, PCH93C-8; Grand Comoro; Id. PCH.

**Otolith shape:** Oval-ovate. **Thickness:** Moderately thick. **Form:** - **Mesial** convex, - **Lateral** Approximately flat. **Dorsal margin:** Slightly rounded; **sculpture**, lobed to irregular. **Ventral margin:** Rounded and slightly crenate. **Posterior margin:** Sharply rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph with low but distinct anterior colliculum, raised dorsal margin; posterior with raised margins, depressed centre. **Pseudocolliculum:** Absent. **Ostium:** Approximately oval, flared dorsally. **Cauda:** Slightly angled ventrally with short flexed tip. **Ostio-caudal differentiation:** Distinctly ventrally, slightly dorsally constricted. **Ostium/cauda:** 1:1.1. **Collum:** Absent. **Crista superior:** Poorly developed under anterior ostium, a strong ridge from mid-ostium to flexion, well developed at caudal tip. **Crista inferior:** Poorly developed under anterior ostium, well developed elsewhere. **Dorsal depression:** Elongate and relatively deep from neck to flexion. **Ventral depression:** Absent, a groove runs close to margin from ostium to caudal tip. **Rostrum:** Moderate, broad and pointed. **Antirostrum:** Minute and sharply rounded. **Excisura:** Moderately wide, notch very shallow, angle wide.

## TERAPONIDAE Nelson No. 291

**Family characteristics:** Two species described. Otoliths oval becoming oblong or fusiform, up to c. 9.4 mm OD. Heterosulcoid with ostial opening, cauda flexed near tip. Heteromorph.

### Key

- 1a. Otolith oval-oblong and broad; ostium oval; sulcus constricted dorso-ventrally; tip of cauda closed . . . . . *Terapon jarbua* 173.2
- 1b. Otolith oblong-fusiform; ostium elongate; sulcus constricted slightly dorsally; tip of cauda indistinctly closed . . . . . *Terapon theraps* 173.3

### *Terapon jarbua*, SSF No. 173.2 PLATE 64

**DISTRIBUTION:** Widely distributed in Indo-West Pacific region, extends to Knysna, uncommon south of the Kei River. Attains 33 cm.

**MATERIAL:** 5/16 (0.8-9.36 mm OD, 24-307 mm TL), PEM 2834, 2833, 2831, 2830, 2341; Kosi Bay and Umvoti River mouth; Id. RvdE.

**Otolith shape:** Oval (c. 0.8 mm OD) to oblong with growth (>c. 3 mm OD). **Thickness:** Moderate, thickening in large otoliths. **Form:** - **Mesial** slightly convex, - **Lateral** concave. **Dorsal margin:** Rounded; **sculpture**, lobed to crenate or irregular. **Ventral margin:** Rounded, becoming slightly rounded and irregular or crenate. **Posterior margin:** Rounded in small otoliths (c. 0.8 mm OD) becoming rounded or sharply rounded in large otoliths, and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, colliculi are nodular in large otoliths, not distinct in juveniles. **Pseudocolliculum:** Absent. **Ostium:** Approximately oval. **Cauda:** Straight for 3/4 of length, ventral flexion near tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.8, 1:1.5, 1:1, 1:1.6, 1:1.6. **Collum:** Absent, no step present. **Crista superior:** Poorly developed over anterior ostium, well developed elsewhere, may be low ridge over anterior

cauda. **Crista inferior:** Well developed along sulcus length except low ridge under ostium in large otoliths only (>c. 3 mm OD). **Dorsal depression:** Very shallow. **Ventral depression:** Absent. **Rostrum:** Broad and sharply rounded. **Antirostrum:** Absent or small and rounded. **Excisura:** Moderate, notch shallow, angle varies.

### *Terapon theraps*, SSF No. 173.3 PLATE 64

**DISTRIBUTION:** Widely distributed in tropical Indo-West Pacific region; from Durban northwards. Attains 30 cm SL.

**MATERIAL:** 4/5 (2.5-4.75 mm OD, 77-155 mm TL), PEM 15293 (RUSI 36876), 15292 (RUSI 36876), 1693, 0617; Durban and Tugela Bank; Id. GJBR, MJS, PCH.

**Otolith shape:** Oblong to fusiform. **Thickness:** Moderately thin. **Form:** - **Mesial** slightly convex, - **Lateral** concave. **Dorsal margin:** Rounded; **sculpture**, crenate and very irregular. **Ventral margin:** Slightly rounded and irregular or serrate. **Posterior margin:** Sharply rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low and rugose anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Narrow and elongate. **Cauda:** Straight, gently flexed near tip. **Ostio-caudal differentiation:** Very slight dorsal constriction. **Ostium/cauda:** 1:1.1, 1:1.1, 1:1.9, 0617 broken. **Collum:** Absent, very slight step. **Crista superior:** Ridge-like almost entire length of sulcus, poor after flexion. **Crista inferior:** Poor under ostium, well developed along rest of sulcus. **Dorsal depression:** Very shallow, area grooved. **Ventral depression:** Absent. **Rostrum:** Large and pointed. **Antirostrum:** Large, sharply rounded. **Excisura:** Moderate, notch shallow, angle varies.

## KUHLIIDAE Nelson No. 293

**Family characteristics:** Only one species available. Otoliths oblong, up to c. 6 mm OD, heterosulcoid, ostial opening. Heteromorph, indistinct colliculi. Cauda long and narrow, flexed at tip.

### *Kuhlia mugil*, SSF No. 164.1 PLATE 64

**DISTRIBUTION:** Abundant throughout Indo-Pacific from Galapagos to Africa, south to Cape Agulhas. Attains 20 cm.

**MATERIAL:** 4/10 (c. 3.2-5.5 mm OD, 64-228 mm TL), PEM 2842, 14584 (RUSI 31441), 7441, 7440; northern Natal and East London; Id. GRA, MJS, PCH.

**Otolith shape:** Oblong. **Thickness:** Moderate. **Form:** - **Mesial** slightly convex, - **Lateral** concave. **Dorsal margin:** Approximately flat; **sculpture**, slightly irregular. **Ventral margin:** Slightly rounded, serrated and irregular. **Posterior margin:** Rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, indistinct, depressed colliculi. **Pseudocolliculum:** Absent. **Ostium:** Lies on rostrum, oval and slightly flared dorsally. **Cauda:** Long, deep and narrow, strongly flexed at tip, deeper groove in end two thirds. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.9 (14584), 1:1.7 (7441), others broken. **Collum:** Absent. **Crista superior:** Poor over ostium, ridge-like over anterior cauda, well developed towards tip. **Crista inferior:** Poor under anterior of ostium, well developed elsewhere. **Dorsal depression:** Oval and deep, area reduced and narrow. **Ventral depression:** Area from caudal tip to margin and neck depressed and surface rough. **Rostrum:** Broad and sharply rounded. **Antirostrum:** Small to moderate, pointed. **Excisura:** Wide, notch shallow, angle acute.

## PRIACANTHIDAE Nelson No. 296

**Family characteristics:** Otoliths of the genus *Cookeolus* very different from genus *Priacanthus*. *Cookeolus*: oval, up to 6.4 mm OD, heterosulcoid, with oval ostium and gently flexed cauda, with distinct cristae along the length of sulcus. Heteromorph. *Priacanthus*: approximately pyriform up to c. 2.9 mm OD, heterosulcoid



with indistinct ostium, cauda with ridge-like cristae. Anterior colliculum rod-like, usually penetrates excisura.

#### Key

- 1a. Otolith oval; sulcus with 'normal' perciform oval ostium . . . . . *Cookeolus japonicus* 174.1
- 1b. Otolith approximately pyriform; sulcus with flared ostium with poorly defined margins . . . . . 2
- 2a. Anterior of otolith with single protrusion - the colliculum; cauda flexed but shallow . . . . . *Priacanthus* sp. 174.-
- 2b. Anterior of otolith with trident-like projections - rostrum, antirostrum and colliculum; cauda sinuous with well defined margins, tip not closed: *Priacanthus cruentatus* 174.2 and *Priacanthus hamrur* 174.3 (these species indistinguishable).

#### *Cookeolus japonicus* (previously *C. boops*), SSF No. 174.1 PLATE 65

**DISTRIBUTION:** Beira to Algoa Bay. Attains 60 cm.

**MATERIAL:** 3/4 (5.8-6.4 mm OD, 213-252 mm TL), PEM 11601, 13070, 13069 (RUSI 28361); off Algoa Bay and Cape south coast; Id. MJS, PCH.

**Otolith shape:** Oval. **Thickness:** Thin. **Form:** - Mesial slightly convex, - Lateral concave. **Dorsal margin:** Rounded; **sculpture**, crenate. **Ventral margin:** Rounded or angular and dentate to digitate. Digitations may fuse at tips to leave holes through the otolith. **Posterior margin:** Rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low anterior colliculum protrudes through the excisura, posterior indistinct but indented. **Pseudocolliculum:** Absent. **Ostium:** Narrow, elongate and approximately oval. **Cauda:** Deeper than ostium, cauda flares dorsally, flexes ventrally, with tip near margin. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:0.9, 1:0.9, 1:0.8. **Collum:** Absent but area between ostium and cauda slightly raised. **Crista superior:** Well developed at extremes, becoming ridge-like from posterior ostium along cauda. **Crista inferior:** Mostly well developed becoming low ridge towards end of cauda. **Dorsal depression:** Oval and distinct. **Ventral depression:** Absent, area irregular. **Rostrum:** Small and pointed, curves laterally. **Antirostrum:** Broad and rounded. **Excisura:** Small, notch shallow, angle acute.

#### *Priacanthus cruentatus*, SSF No. 174.2 PLATE 65

**DISTRIBUTION:** East coast of Africa to Hawaii, south to at least Durban; also in Atlantic. Attains 30 cm.

**MATERIAL:** 4/25 (1.75-1.9 mm OD, 73-90 mm TL), PEM 3988, 3987, 3990, 3985; Cape south coast; Id. MJS, PCH.

**Otolith shape:** Approximately pyriform. **Thickness:** Posterior moderate, anterior thin. **Form:** - Mesial flat posteriorly, convex anteriorly, - Lateral convex posteriorly, concave anteriorly. **Dorsal margin:** Angled, raised posteriorly; **sculpture**, entire. **Ventral margin:** Keeled and irregular. **Posterior margin:** Rounded and irregular. **Sulcus acusticus:** Ostial, but may appear ostio-caudal as caudal tip is not closed, heterosulcoid. **Colliculum:** Heteromorph, anterior colliculum a raised crest becoming rod-like anteriorly as it penetrates the excisura. This colliculum is easily broken and may therefore be absent. Posterior extremely indistinct, margin may be visible. **Pseudocolliculum:** Absent. **Ostium:** Indented and flared, margins poorly defined. **Cauda:** Sinuous, well defined margins, tip not closed. **Ostio-caudal differentiation:** Indistinct dorso-ventral constrictions. **Ostium/cauda:** 1:1.2, 1:0.9, 1:0.8, 1:1. **Collum:** Absent. **Crista superior:** Very poor over ostium, ridge-like along cauda, absent at tip. **Crista inferior:** Absent under ostium, ridge-like along cauda, absent at tip. **Dorsal depression:** Shallow, above cauda. **Ventral depression:** Absent, area grooved. **Rostrum:** Small, finger-like and pointed. **Antirostrum:**

Moderate and pointed. **Excisura:** Moderate, notch shallow, angle between antirostrum and colliculum is acute.

#### *Priacanthus hamrur*, SSF No. 174.3 PLATE 65

**DISTRIBUTION:** Throughout Indo-Pacific Region (Red Sea, possibly to Hawaii); in this area from Mozambique to Knysna. Attains at least 45 cm.

**MATERIAL:** 9/30 (1.2-2.9 mm OD, 35-365 mm TL), PEM 7189, 14366, 14372, 14364, 14375 (RUSI 28359), 14374 (RUSI 28360), 2194, 4447, 15403 (RUSI 40598), [14365 (RUSI 28358)]; off Madagascar and Southern Cape; Id. MJS, PCH.

**Otolith shape:** Approximately pyriform. **Thickness:** Posterior moderate, anterior thin. **Form:** - Mesial flat posteriorly, convex anteriorly, - Lateral convex posteriorly, concave anteriorly. **Dorsal margin:** Angled and raised to keeled posteriorly; **sculpture**, entire or slightly irregular. **Ventral margin:** Keeled, indented and irregular. **Posterior margin:** Rounded and irregular. **Sulcus acusticus:** Ostial, but may appear ostio-caudal as cauda is not closed, heterosulcoid. **Colliculum:** Heteromorph, anterior colliculum a raised crest becoming rod-like anteriorly as it penetrates the excisura. This colliculum is easily broken and may therefore be absent. Posterior extremely indistinct but may be slightly textured. **Pseudocolliculum:** Absent. **Ostium:** Indented and flared, margins usually poorly defined. **Cauda:** Sinuous, well defined margins, tip not closed. **Ostio-caudal differentiation:** Indistinct dorso-ventral constrictions. **Ostium/cauda:** 1:1, 1:1.5, 1:1.1, 1:1.4, 1:1.3, 1:1.3 (14374, 14372, 14366 broken). **Collum:** Absent. **Crista superior:** Poor over ostium, ridge-like along cauda, absent at tip. **Crista inferior:** Absent under ostium, ridge-like along cauda, absent at tip. **Dorsal depression:** Shallow, above cauda. **Ventral depression:** Absent, area grooved. **Rostrum:** Moderate, finger-like and sharply rounded, curved laterally. **Antirostrum:** Moderate and pointed. **Excisura:** Moderate, notch shallow, angle between antirostrum and colliculum is acute.

#### *Priacanthus* sp., SSF No. 174.— PLATE 65

**DISTRIBUTION:** Known from Mozambique. Attains at least 190 mm TL.

**MATERIAL:** 1/1 (2.9 mm OD, 190 mm TL), PEM 13048 (RUSI 28386); Mozambique. This may be an undescribed species.

**Otolith shape:** Approximately pyriform. **Thickness:** Thin, especially in rostral area. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Raised and rounded; **sculpture**, slightly irregular. **Ventral margin:** Keeled and approximately entire. **Posterior margin:** Rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior colliculum ridge-like running along rostrum, not penetrating excisura. Posterior indistinct and low. **Pseudocolliculum:** Absent. **Ostium:** Very poorly defined, concave above colliculum. **Cauda:** Very sharply flexed, forming a right-angle, moderately deep. **Ostio-caudal differentiation:** Dorsal constriction indistinct. **Ostium/cauda:** 1:0.6. **Collum:** Absent. **Crista superior:** Very poor over ostium, ridge-like over horizontal part of cauda, poorly developed beyond flexion. **Crista inferior:** Absent under ostium, ridge-like under horizontal part of cauda, well developed after flexion. **Dorsal depression:** Shallow over most of dorsal area. **Ventral depression:** Ventral area below crista is raised, lower half is depressed and flat. **Rostrum:** Large and pointed, flexed laterally. **Antirostrum:** Very short and rounded. **Excisura:** Moderate, notch shallow, angle wide.

#### APOGONIDAE Nelson No. 297

**Family characteristics:** Otoliths of the two subfamilies are extremely different and, based on this evidence, suggests that their status needs revision.



The Apogoninae (described here are the genera *Apogon*, *Archamia* and *Cheilodipterus*) are approximately oval to obovate and moderately small, to c. 9 mm OD. Heterosulcoid, opening pseudo-ostial or para-ostial, uncoated may appear ostial with wide excisura. Because excisura may be absent, rostrum and antirostrum may be absent (in uncoated or digested otoliths, they may appear to be present). Ostium oval, often with ventral bulge, c. twice length of cauda. Cauda short, wide and may be dorsally angled, tip may not be closed. Heteromorph, anterior colliculum oval and large, posterior usually low but often has raised ventral margin. Dorsal depression oval and deep.

The Epigoninae (described here is the genus *Epigonus*) are oval to ovate, up to c. 11 mm OD. Heteromorph, opening ostial with distinctly pointed rostrum. Ostium and cauda elongate, caudal tip slightly flexed or flared. Heteromorph colliculi, anterior elongate, posterior very low, may be very indistinct. Dorsal area large with large, shallow depression.

No key is provided as the differences between species are subtle and difficult to distinguish. Direct comparison using identified otoliths may resolve identifications of prey remains.

#### *Apogon angustatus*, SSF No. 175.1 PLATE 65

**DISTRIBUTION:** Indo-West and South Pacific; Red Sea to Natal. Attains 8 cm.

**MATERIAL:** 4/6 (3.0-5.04 mm OD, 43-85 mm TL), PEM 8421 (RUSI 34109), 8419 (RUSI 25474), 8418, 4396; Ledsman Shoal and Kosi Bay; Id. PCH.

**Otolith shape:** Oval. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral approximately flat. **Dorsal margin:** Slightly rounded; **sculpture**, slightly irregular. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Sharply rounded and irregular. **Sulcus acusticus:** Pseudo-ostial in small otoliths, para-ostial in large, heterosulcoid. **Colliculum:** Heteromorph, low oval anterior colliculum, posterior is raised towards the ventral edge with central indentation, pits (about 2-4) may be present. **Pseudocolliculum:** Absent. **Ostium:** Large, approximately oval. **Cauda:** Short, straight and closed at tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:0.6, 1:0.6, 1:0.7, 1:0.6. **Collum:** Absent. **Crista superior:** Very poorly developed at extremes, ridge-like over neck, well developed over cauda. **Crista inferior:** Poorly developed along entire length of sulcus. **Dorsal depression:** Oval and deep. **Ventral depression:** Absent, shallow groove at margin. **Rostrum:** Absent or broad and rounded in large otoliths. **Antirostrum:** Absent or minute in large otoliths. **Excisura:** Absent or very narrow in large otoliths, notch shallow, angle wide.

#### *Apogon apogonides*, SSF No. 175.2 PLATE 65

**DISTRIBUTION:** Rare in this area; Indo-Pacific; south to Durban. Attains 10 cm.

**MATERIAL:** 3/5 (4.8-5.66 mm OD, 89-98 mm TL), 0753H, 0752H, PEM 15632; Sodwana, Comoro Ids; Id. JER, PCH.

**Otolith shape:** Oval to obovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral approximately flat. **Dorsal margin:** Slightly rounded, may become slightly emarginate posteriorly; **sculpture**, irregular, may become notched. **Ventral margin:** Rounded and crenate anteriorly, slightly irregular posteriorly. **Posterior margin:** Rounded and slightly irregular. **Sulcus acusticus:** Pseudo-ostial or para-ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior colliculum large, approximately oval; posterior narrow, raised towards ventral edge, indented in centre. **Pseudocolliculum:** Absent. **Ostium:** Large, approximately oval. **Cauda:** Short, straight, slightly angled dorsally. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:0.6, 1:0.6, 1:0.7. **Collum:** Absent. **Crista superior:** Poorly developed at extremes, well developed to ridge-like over neck and

cauda. **Crista inferior:** Poorly developed under ostium, very poorly developed under cauda and at extremes. **Dorsal depression:** Deep and oval. **Ventral depression:** Absent. **Rostrum:** Absent or sharply rounded. **Antirostrum:** Absent or broad and blunt. **Excisura:** Absent or very narrow, notch shallow, angle wide if present.

#### *Apogon aureus*, SSF No. 175.3 PLATE 65

**DISTRIBUTION:** A common Indo-West-Pacific species; Red Sea south to Durban. Attains c. 12 cm.

**MATERIAL:** 2/3 (5.9, 6.4 mm OD, 111, 112 mm TL), PEM 3910, 3911; Ledsman Shoal; Id. PCH.

**Otolith shape:** Oval to obovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral approximately flat. **Lateral surface:** Distinct, shallow groove runs dorso-ventrally. **Dorsal margin:** Slightly rounded; **sculpture**, irregular. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Rounded and slightly irregular. **Sulcus acusticus:** Para-ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior colliculum is oval, narrowing anteriorly, posterior is raised at ventral edge, indented in centre. **Pseudocolliculum:** Absent. **Ostium:** Large, oval. **Cauda:** Narrow, short, slight curve in dorsal margin, dorsally angled, tip open. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:0.6, 1:0.7. **Collum:** Absent. **Crista superior:** Poorly developed at extremes, short ridge over neck, well developed over posterior cauda. **Crista inferior:** Poorly developed under ostium, very poorly developed under cauda. **Dorsal depression:** Deep and oval. **Ventral depression:** Short, shallow depression below caudal tip. **Rostrum:** Broad and rounded. **Antirostrum:** Broad and rounded. **Excisura:** Very narrow, notch very shallow, angle wide.

#### *Apogon coccineus*, SSF No. 175.4 PLATE 66

**DISTRIBUTION:** Widespread in Indo-Pacific; Red Sea south to Sodwana. Attains 5 cm.

**MATERIAL:** 1/1 (2.85 mm OD, 43 mm TL), PEM 2914; Sodwana Bay; Id. GRA.

**Otolith shape:** Oval. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral slightly convex. **Dorsal margin:** Slightly rounded; **sculpture**, slightly irregular. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Sharply rounded and entire. **Sulcus acusticus:** Para-ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior colliculum elongate oval, blunt posteriorly; posterior short, raised towards ventral section, indented with pits in centre. **Pseudocolliculum:** Absent. **Ostium:** Large, elongate oval. **Cauda:** Very short, straight. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:0.5. **Collum:** Absent. **Crista superior:** Poorly developed at extremes, well developed elsewhere. **Crista inferior:** Poorly developed along entire length. **Dorsal depression:** Deep and oval. **Ventral depression:** Absent, groove close to margin from ostium to cauda. **Rostrum:** Broad, short and rounded. **Antirostrum:** Minute and rounded. **Excisura:** Very narrow, notch very shallow, angle acute.

#### *Apogon cookii*, SSF No. 175.5 PLATE 66

**DISTRIBUTION:** Indo-Pacific; common in the western Indian Ocean, south to Durban. Attains 10 cm.

**MATERIAL:** 3/5 (3.25-5.84 mm OD, 58-114 mm TL), PEM 2720, 2667, 1401H, [15748 & 15749 (both RUSI 42693)]; Natal and kwaZulu; Id. OG, PCH.

**Otolith shape:** Oval to obovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral approximately flat. **Lateral surface:** Low dorso-ventral ridge in mid-section. **Dorsal margin:** Raised anteriorly, slightly rounded; **sculpture**, irregular. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Sharply



rounded and slightly irregular. **Sulcus acusticus:** Pseudo-ostial (<5.5 mm OD) becoming para-ostial with growth (c. 5.8 mm OD), heterosulcoid. **Colliculum:** Heteromorph, anterior colliculum approximately oval, posterior only slightly raised towards ventral margin. **Pseudocolliculum:** Absent. **Ostium:** Approximately oval, dorsal margin may be raised. **Cauda:** Short, narrow and straight or slightly flexed. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:0.5, 1:0.6, 1:0.5. **Collum:** Absent. **Crista superior:** Poorly developed at extremes, low ridge over neck, well developed over posterior cauda. **Crista inferior:** Poorly developed under ostium, very poorly developed under cauda. **Dorsal depression:** Shallow and narrow. **Ventral depression:** Absent, may be shallow groove under anterior half. **Rostrum:** Absent or short, broad and rounded. **Antirostrum:** Absent or minute and rounded. **Excisura:** Absent or very narrow, notch shallow, angle wide.

#### *Apogon cyanosoma*, SSF No. 175.6 PLATE 66

**DISTRIBUTION:** Common from Mozambique Is. northward, in Red Sea, Indo-West Pacific. Attains 8 cm.

**MATERIAL:** 4/6 (3.5-4.3 mm OD, 62-74 mm TL), 0981H, PEM 15753 (RUSI 42695), 15699 (RUSI 42660), 15751 (RUSI 42695); Eilat, Red Sea; Id. AB, MJS, PCH.

**Otolith shape:** Oval. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral approximately flat. **Dorsal margin:** Rounded; sculpture, slightly irregular. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Blunt and slightly irregular. **Sulcus acusticus:** Para-ostial with two shallow canals to margin from anterior ostium, heterosulcoid. **Colliculum:** Heteromorph, anterior colliculum oval, posterior straight and raised on ventral edge. **Pseudocolliculum:** Absent. **Ostium:** Oval, dorsal wall raised. **Cauda:** Approximately straight and short. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:0.7, 1:0.6, 1:0.6, 1:0.6. **Collum:** Absent. **Crista superior:** Very poorly developed at extremes, low ridge from posterior ostium over neck and along anterior cauda. **Crista inferior:** Poorly developed under ostium, very poorly developed under cauda. **Dorsal depression:** Oval and very deep. **Ventral depression:** Absent, very shallow margin groove from ostium to caudal tip. **Rostrum:** Short, broad and rounded (taken from top canal). **Antirostrum:** Minute and rounded. **Excisura:** Very narrow, notch very shallow, angle wide.

#### *Apogon fraenatus*, SSF No. 175.9 PLATE 66

**DISTRIBUTION:** Indo-West Pacific; Red Sea to Durban. Attains 10 cm.

**MATERIAL:** 3/3 (3.1-6.8 mm OD, 46-117 mm TL), PEM 8416, 8415, 14262; Comoro Ids and Kosi Bay; Id. PCH.

**Otolith shape:** Approximately oval to obovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral approximately flat. **Dorsal margin:** Approximately flattened; sculpture, slightly irregular. **Ventral margin:** Rounded and irregular. **Posterior margin:** Sharply rounded and irregular. **Sulcus acusticus:** Pseudo-ostial becoming para-ostial with growth (>c. 4 mm OD), heterosulcoid. **Colliculum:** Heteromorph, anterior colliculum oval, posterior is large, may be raised only ventrally in small otoliths, in large it fills cauda. **Pseudocolliculum:** Absent. **Ostium:** Approximately oval and elongate with distinct dorsal hump. **Cauda:** Short, wide and slightly flexed dorsally. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:0.5, 1:0.5, 1:0.5. **Collum:** Absent. **Crista superior:** Poorly developed at extremes, well developed elsewhere, steep wall near caudal tip. **Crista inferior:** Very poorly developed under cauda, poorly developed under ostium. **Dorsal depression:** Oval and deep. **Ventral depression:** Absent, distinct groove close to margin in largest otolith but not distinct in small otoliths.

**Rostrum:** Absent or broad and rounded. **Antirostrum:** Small and rounded. **Excisura:** Absent or minute, notch very shallow, angle wide.

#### *Apogon kallopterus*, SSF No. 175.12 PLATE 66

**DISTRIBUTION:** Common in Indo-Pacific; Red Sea and south to Algoa Bay. Attains 15 cm.

**MATERIAL:** 5/20 (4.0-6.68 mm OD, 65-114 mm TL), PEM 2745, 2928, 15651, 2797, 15589; off Sodwana, Comoro Ids; Id. GJBR, GRA, PCH, 2 lodged in JLBSII.

**Otolith shape:** Oval to obovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral approximately flat. **Lateral surface:** Depression on dorsal surface in large otoliths. **Dorsal margin:** Approximately flat, raised anteriorly; sculpture, irregular. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Sharply rounded or blunt and slightly irregular. **Sulcus acusticus:** Pseudo-ostial or para-ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior colliculum is oval and extends posteriorly through neck; posterior is raised on ventral margin. **Pseudocolliculum:** Absent. **Ostium:** Large, approximately oval. **Cauda:** Short, approximately straight, angled slightly dorsally. **Ostio-caudal differentiation:** Dorso-ventral constriction. **Ostium/cauda:** 1:0.5, 1:0.6, 1:0.5, 1:0.4, 1:0.6. **Collum:** Absent. **Crista superior:** Very poorly developed at extremes, ridge-like over neck and well developed over posterior cauda. **Crista inferior:** Poorly developed under ostium, very poorly developed under cauda. **Dorsal depression:** Oval and deep. **Ventral depression:** Absent, groove near margin, especially in large otoliths. **Rostrum:** Absent or broad and rounded. **Antirostrum:** Absent or minute and rounded. **Excisura:** Absent or very narrow, notch very shallow, angle wide.

#### *Apogon lateralis*, SSF No. 175.14 PLATE 66

**DISTRIBUTION:** Indo-West Pacific, often found in fresh water and in estuaries, south to Inhaca Is. Attains 10 cm.

**MATERIAL:** 1/1 (3.0 mm OD, 43 mm TL), PEM 8411 (RUSI 34113); Kosi Bay; Id. PCH.

**Otolith shape:** Oval. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral flat. **Dorsal margin:** Rounded; sculpture, irregular. **Ventral margin:** Well rounded and slightly irregular. **Posterior margin:** Sharply rounded and slightly irregular. **Sulcus acusticus:** Para-ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior colliculum oval and moderately narrow; posterior is narrow and raised at ventral edge. **Pseudocolliculum:** Absent. **Ostium:** Oval, narrowing anteriorly. **Cauda:** Angled slightly dorsally, short and narrower than ostium. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:0.5. **Collum:** Absent. **Crista superior:** Very poorly developed at extremes, low ridge over neck area. **Crista inferior:** Poorly developed under ostium, absent under cauda. **Dorsal depression:** Oval and deep. **Ventral depression:** Absent, groove close to margin from ostium to caudal tip. **Rostrum:** Broad, short and rounded. **Antirostrum:** Minute and rounded. **Excisura:** Narrow, notch shallow, angle wide.

#### *Apogon multitaeniatus*, SSF No. 175.16 PLATE 66

**DISTRIBUTION:** Indo-West Pacific, Red Sea to Durban. Attains 18 cm.

**MATERIAL:** 2/3 (9.1, 9.14 mm OD, 171, 175 mm TL), PEM 6004, 1395H; Durban; Id. OG.

**Otolith shape:** Approximately oval. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral slightly concave. **Lateral surface:** Dorso-ventral indentation in mid-otolith. **Dorsal margin:** Approximately flat; sculpture, irregular. **Ventral margin:** Well rounded and slightly irregular. **Posterior margin:** Blunt and slightly irregular. **Sulcus acusticus:** Para-ostial and para caudal (with groove running from tip of cauda to margin), hetero-



sulcoid. **Colliculum:** Heteromorph, anterior colliculum large and broad, filling the ostium; posterior large, low and fills cauda, with two indentations, but not raised ventrally. **Pseudocolliculum:** Absent. **Ostium:** Large and broad, ventral margin straight. **Cauda:** Angled dorsally with flared, squared end and a channel to postero-dorsal corner. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:0.6, 1:0.7. **Collum:** Absent. **Crista superior:** Poorly developed under anterior ostium, ridge-like over neck and well developed over posterior cauda. **Crista inferior:** Poorly developed along length of sulcus. **Dorsal depression:** Large and oval, shallow ventrally, deeper dorsally. **Ventral depression:** Absent, groove near margin from ostium to cauda. **Rostrum:** Short, blunt and rounded. **Antirostrum:** Minute and rounded. **Excisura:** Narrow, notch shallow, angle varied.

***Apogon quadrifasciatus*, SSF No. 175.20 PLATE 67**

**DISTRIBUTION:** Indo-West Pacific; Red Sea to Inhaca Is. Attains 10 cm.

**MATERIAL:** 1/1 (6.76 mm OD, 92 mm TL), PEM 0230; off Tugela mouth; Id. GJBR.

**Otolith shape:** Oval. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral approximately flat. **Dorsal margin:** Slightly rounded; **sculpture**, slightly irregular. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Rounded and slightly irregular. **Sulcus acusticus:** Para-ostial, caudal tip not closed, heterosulcoid. **Colliculum:** Heteromorph, anterior colliculum oval, extending posteriorly through neck. Posterior colliculum not well defined and not raised ventrally. **Pseudocolliculum:** Absent. **Ostium:** Oval, narrows anteriorly and posteriorly. **Cauda:** Angled dorsally slightly, tip open, shallow pit in centre of cauda. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:0.5. **Collum:** Absent. **Crista superior:** Poorly developed over anterior ostium, ridge-like over neck and well developed over posterior cauda, absent at tip. **Crista inferior:** Poorly developed under ostium, very poorly developed under cauda. **Dorsal depression:** Large and oval, may extend to margin. **Ventral depression:** Absent, no groove, area irregular. **Rostrum:** Small and sharply rounded. **Antirostrum:** Minute and rounded. **Excisura:** Narrow, notch very shallow, angle wide.

***Apogon savayensis*, SSF No. 175.22 PLATE 67**

**DISTRIBUTION:** Indo-Pacific; Red Sea south to Inhaca Is. Attains 10 cm.

**MATERIAL:** 2/2 (both 5.0 mm OD, 83, 89 mm TL), PEM 15645, 0986H; Red Sea, Comoro Ids; Id. PCH, AB, TH.

**Otolith shape:** Rounded to triangular. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral flat. **Dorsal margin:** Approximately straight or angled but notched and rounded anteriorly; **sculpture**, very irregular. **Ventral margin:** Keeled and slightly irregular. **Posterior margin:** Sharply rounded and slightly irregular. **Sulcus acusticus:** Para-ostial, cauda not distinctly closed, heterosulcoid. **Colliculum:** Heteromorph, anterior low, square to rectangular; posterior colliculum is raised ventrally and dorsally, indented posteriorly. **Pseudocolliculum:** Absent. **Ostium:** Bulbous ventrally, top of ostium has channel to dorsal depression. **Cauda:** Slightly angled dorsally, posterior very deep with groove in centre, tip not closed. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:0.8, 1:0.5. **Collum:** Absent. **Crista superior:** Absent at very anterior ostium, ridge-like over neck, poorly developed over posterior cauda. **Crista inferior:** Poorly developed under ostium, very poorly developed under cauda, absent at tip. **Dorsal depression:** Deep, oval and open to dorsal margin and ostium. **Ventral depression:** Absent, groove from tip of ostium, becoming deeper and wider to caudal tip. **Rostrum:** Short, broad and rounded. **Antirostrum:**

Very short, broad and rounded. **Excisura:** Very narrow, notch shallow, angle wide.

***Apogon semionatus*, SSF No. 175.23 PLATE 67**

**DISTRIBUTION:** Indo-West Pacific, south to Durban. Attains c. 7 cm.

**MATERIAL:** 4/15 (2.2-4.35 mm OD, 31-67 mm TL), PEM 8435, 8412 (RUSI 34112), 2846, 3883, [8433 (RUSI 34110)]; Kosi Bay and Durban; Id. GRA, PCH.

**Otolith shape:** Approximately oval. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral convex. **Dorsal margin:** Slightly rounded; **sculpture**, slightly irregular and notched. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Sharply rounded and slightly irregular. **Sulcus acusticus:** Para-ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior is oval and low, posterior is raised ventrally, otherwise poorly developed. **Pseudocolliculum:** Absent. **Ostium:** Elongate and oval. **Cauda:** Widens with growth, approximately straight, may have groove in centre. **Ostio-caudal differentiation:** Slight dorso-ventral constriction. **Ostium/cauda:** 1:0.6, 1:0.5, 1:0.4, 1:0.4. **Collum:** Absent. **Crista superior:** Well developed becoming ridge-like at neck, poorly developed elsewhere. **Crista inferior:** Poorly developed along sulcus length. **Dorsal depression:** Deep and oval, may open to margin at a notch. **Ventral depression:** Absent, groove close to margin from ostium to tip of cauda. **Rostrum:** Small, broad and rounded. **Antirostrum:** Minute, broad and rounded. **Excisura:** Very narrow, notch shallow, angle wide.

***Apogon taeniorhynchus*, SSF No. 175.25 PLATE 67**

**DISTRIBUTION:** Indian Ocean; south to Sodwana Bay. Attains 8 cm.

**MATERIAL:** 1/1 (4.55 mm OD, 60 mm SL), 1379H; Sodwana Bay; Id. MMS, JER, GRA.

**Otolith shape:** Oval. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral slightly convex. **Dorsal margin:** Slightly rounded; **sculpture**, slightly lobed. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Sharply rounded and slightly irregular. **Sulcus acusticus:** Pseudo-ostial, heterosulcoid. **Colliculum:** Heteromorph with anterior colliculum approximately oval and low, posterior colliculum raised ventrally otherwise poorly defined. **Pseudocolliculum:** Absent. **Ostium:** Oval, filled by colliculum. **Cauda:** Approximately straight and short, dorso-posterior is deeper than the rest. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:0.5. **Collum:** Absent. **Crista superior:** Very poorly developed at extremes, well developed over neck. **Crista inferior:** Poorly developed under ostium, absent under cauda. **Dorsal depression:** Shallow, oval in shape and moderately large, not distinct. **Ventral depression:** Absent, no groove. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

***Archamia fucata*, SSF No. 175.30 PLATE 67**

**DISTRIBUTION:** Zanzibar to Sodwana Bay. Attains 8 cm.

**MATERIAL:** 2/2 (2.95, 3.35 mm OD, 52, 54 mm TL), PEM 15700 & 15701 (both RUSI 42658); Gulf of Suez; Id. OG.

**Otolith shape:** Discoid to obovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral slightly convex. **Dorsal margin:** Approximately flattened and angled; **sculpture**, slightly irregular. **Ventral margin:** Well rounded and slightly irregular. **Posterior margin:** Sharply rounded and slightly irregular. **Sulcus acusticus:** Pseudo- or para-ostial, heterosulcoid. **Colliculum:** Heteromorph with anterior colliculum approximately rounded wedge-shape, broad anteriorly; posterior with margin raised ventrally otherwise poorly defined. **Pseudocolliculum:** Absent. **Ostium:** Short, broad, flared anteriorly, filled by colliculum, with anterior lip. **Cauda:** Short, slightly flexed dorsally, dorso-posterior is deeper



than the rest. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:0.8, 1:0.8. **Collum:** Absent. **Crista superior:** Well developed over anterior ostium, ridge-like from mid-ostium to caudal tip. **Crista inferior:** Poorly developed under ostium, absent under cauda. **Dorsal depression:** Shallow, oval in shape and moderately large, not distinct. **Ventral depression:** Absent, shallow groove at margin, area may be rough. **Rostrum:** Absent or short, broad and rounded. **Antirostrum:** Absent or very short and very broad. **Excisura:** Absent or narrow, notch shallow, angle wide.

***Cheilodipterus lineatus*, SSF No. 175.36 PLATE 67**

**DISTRIBUTION:** Indo-Pacific; Red Sea, south to Sodwana Bay. Attains 22 cm.

**MATERIAL:** 2/2 (8.4, 9.4 mm OD, 138, 200 mm SL), PEM 14795 (RUSI 31412), 15781; St Lucia Marine Reserve, Comoro Ids; Id. PCH.

**Otolith shape:** Oval. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral approximately flat. **Lateral surface:** Depression on dorsal and ventral margins joined by low ridge in midsection. **Dorsal margin:** Approximately flat with notch; **sculpture**, irregular. **Ventral margin:** Rounded and slightly irregular, crenate posteriorly. **Posterior margin:** Sharply rounded and irregular. **Sulcus acusticus:** Para-ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior colliculum oval and elongate, posterior is raised ventrally, uneven and indented in centre. **Pseudocolliculum:** Absent. **Ostium:** Elongate, dorsal wall raised and angled in midpoint. **Cauda:** Short and straight, angled slightly dorsally. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:0.6, 1:0.7. **Collum:** Absent. **Crista superior:** Absent at extremes, ridge-like elsewhere. **Crista inferior:** Poorly developed under ostium, very poor under cauda. **Dorsal depression:** Oval, deep and open to dorsal wall at notch. **Ventral depression:** Absent, wide and shallow groove near margin. **Rostrum:** Short, broad and rounded. **Antirostrum:** Very short and rounded. **Excisura:** Very narrow, notch shallow, angle varied.

***Epigonus denticulatus*, SSF No. 175.45 PLATE 67**

**DISTRIBUTION:** Mediterranean to South Africa (Walvis Bay to Cape Point); Caribbean, Japan, Australia and New Zealand. Depth range 200-800 m. Attains 20 cm.

**MATERIAL:** 4/5 (4.6-7.8 mm OD, 93-164 mm TL), PEM 14707, 14746 (RUSI 31379), 14705, 14151 (RUSI 28362); Cape west coast and off Namibia; Id. MJS, MEA.

**Otolith shape:** Triangular to ovate. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral flat or slightly concave. **Dorsal margin:** Slightly rounded or flat; **sculpture**, crenate. **Ventral margin:** Well rounded and crenate posteriorly, otherwise irregular. **Posterior margin:** Rounded and slightly lobed. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph with rectangular anterior colliculum, posterior colliculum elongate and very low. **Pseudocolliculum:** Absent. **Ostium:** Elongate with parallel walls, kinked on dorsal wall near excisura. **Cauda:** Approximately straight, flaring posteriorly, posterior tip poorly defined. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:0.9, 1:0.8, 1:0.7, 1:0.7. **Collum:** Absent. **Crista superior:** Very poorly developed at extremes, low narrow ridge elsewhere, absent at caudal tip. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Elongate, very shallow and indistinct. **Ventral depression:** Absent, no groove. **Rostrum:** Large and pointed. **Antirostrum:** Large and pointed. **Excisura:** Moderate, notch moderately deep, angle acute.

***Epigonus cf. robustus* A, SSF No. 175.47A PLATE 68**

**DISTRIBUTION:** Southern hemisphere, South American Atlantic coast, off west coast of South Africa and southern Australia; depth range 800-1200 m (but see below). Attains at least 20 cm.

**MATERIAL:** 7/7 (6.2-8.6 mm OD, 136-194 mm TL), PEM 14958, 14959, 14957, 14955, 14956, 14954, 14953 (all 7 are RUSI 35606); Cape south coast from 330-570m; Id. MJS, MEA. **NOTE:** Although this species appeared to be *E. robustus*, differences in depth distribution and marked differences in the otoliths clearly suggests two morphologically similar species.

**Otolith shape:** Oval to ovate. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral flat. **Lateral surface:** Has dorso-ventral groove in mid-section. **Dorsal margin:** Slightly rounded; **sculpture**, crenate or entire. **Ventral margin:** Rounded and crenate or slightly irregular. **Posterior margin:** Rounded and crenate or irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior colliculum is raised, elongate and approximately rectangular; posterior indistinct. **Pseudocolliculum:** Absent. **Ostium:** Elongate with parallel walls. **Cauda:** Very long, ends near margin with slight ventral flexion. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:1, 1:0.8, 1:1, 1:0.9, 1:1, 1:0.9, 1:0.9. **Collum:** Absent. **Crista superior:** Well developed or ridge-like over entire sulcus. **Crista inferior:** Well developed under entire sulcus. **Dorsal depression:** Very shallow, covering almost entire area. **Ventral depression:** Very shallow crescent in mid-area. **Rostrum:** Moderate and pointed. **Antirostrum:** Moderate and pointed. **Excisura:** Moderately wide, notch shallow, angle acute.

***Epigonus cf. robustus* B (deep water form, 700-950 m), SSF No. 175.47B PLATE 68**

**DISTRIBUTION:** Southern hemisphere, South American Atlantic coast, off west coast of South Africa and southern Australia; depth range 800-1200 m. Attains at least 22 cm.

**MATERIAL:** 3/29 (6.7-9.7 mm OD, 160-216 mm TL), PEM 13650, 13418, 14606; southwest Cape and Namibia; lodged in SAM.

**Otolith shape:** Oval. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral slightly convex. **Lateral surface:** Raised nucleus with distinct concentric growth rings. **Dorsal margin:** Rounded; **sculpture**, irregular. **Ventral margin:** Rounded and irregular. **Posterior margin:** Sharply rounded or notched and irregular. **Sulcus acusticus:** Ostial, cauda not closed, heterosulcoid. **Colliculum:** Heteromorph, large oval anterior colliculum, posterior colliculum raised along ventral margin. **Pseudocolliculum:** Absent. **Ostium:** Approximately oval, narrow and slightly angled dorsally. **Cauda:** Approximately horizontal and open at tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:0.7, 1:0.8, 1:0.8. **Collum:** Absent. **Crista superior:** Well developed over anterior ostium, ridge-like over rest of sulcus, absent at caudal tip. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Oval, large and deep, covering most of dorsal area. **Ventral depression:** Absent, no groove but ventral area behind caudal tip is depressed. **Rostrum:** Small, broad and pointed. **Antirostrum:** Minute and rounded. **Excisura:** Moderately wide, notch very shallow, angle wide.

***Epigonus telescopus*, SSF No. 175.48 PLATE 68**

**DISTRIBUTION:** Anti-tropical distribution in Atlantic Ocean; one record off northeast coast of United States, common in Mediterranean and northeast Atlantic; also from Walvis Bay to Cape Town; reported off east New Zealand; depth range 80-1200 m. Attains 50 cm.



**MATERIAL:** 2/2 (5.68, 11.0 mm OD, 125, 235 mm TL), 1514H, 1513H; Agulhas Bank; Id. PCH.

**Otolith shape:** Oval to ovate. **Thickness:** Moderate. **Form:** - **Mesial** slightly convex, - **Lateral** flat. **Dorsal margin:** Slightly rounded; **sculpture**, very irregular. **Ventral margin:** Rounded, crenate to serrate. **Posterior margin:** Rounded or sharply rounded and slightly irregular. **Sulcus acusticus:** Ostial, cauda not closed, heterosulcoid. **Colliculum:** Heteromorph, large rectangular anterior colliculum; posterior, extremely indistinct. **Pseudocolliculum:** Absent. **Ostium:** Approximately rectangular to oval. **Cauda:** Horizontal, flared posteriorly. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:0.6, 1:0.7. **Collum:** Absent. **Crista superior:** Ridge-like along entire length of sulcus, absent at tip. **Crista inferior:** Moderately well developed under ostium, well developed or low ridge under cauda. **Dorsal depression:** Shallow and large, covering almost entire dorsal area. **Ventral depression:** Absent; large, broad groove from ostium to caudal tip near margin. **Rostrum:** Large, broad and pointed. **Antirostrum:** Large and sharply rounded. **Excisura:** Moderate, notch deep, angle acute.

**SILLAGINIDAE Nelson No. 299**

**Family characteristics:** Two species available. Otoliths are oblong to rounded triangular, up to c. 10 mm OD. Archaesulcoid, sinuous sulcus extends the length of otolith and has ostial opening. Homomorph colliculum which appears low and granular. Dorsal area reduced.

**Key**

- 1a. Sulcus slightly sinuous; dorsal depression present  
..... *Sillago sihama* 198.3
- 1b. Sulcus curved convexly; dorsal depression absent  
..... *Sillago chondropus* 198.1

***Sillago chondropus*, SSF No. 198.1 PLATE 68**

**DISTRIBUTION:** A widespread Indo-West Pacific species, extends south to Durban. Attains at least 35 cm.

**MATERIAL:** 1/1 (10.0 mm OD, 352 mm TL), PEM 6000; locality unknown.

**Otolith shape:** Oblong to rounded triangular. **Thickness:** Moderate. **Form:** - **Mesial** strongly convex, - **Lateral** strongly concave. **Dorsal margin:** Slightly rounded; **sculpture**, irregular. **Ventral margin:** Rounded and approximately entire. **Posterior margin:** Very sharply rounded and entire. **Sulcus acusticus:** Ostial, archaesulcoid. **Colliculum:** Homomorph, with single, low, granular-surfaced colliculum. **Pseudocolliculum:** Absent. **Ostium and cauda:** Undifferentiated, sinuous sulcus lies close to dorsal margin, along whole length of otolith. **Ostio-caudal differentiation:** No constrictions. **Collum:** Absent. **Crista superior:** Poorly developed along sulcus length. **Crista inferior:** Poorly developed along length of sulcus. **Dorsal depression:** Absent, dorsal area reduced. **Ventral depression:** Elongate pit, otherwise area smooth and rounded. **Rostrum:** Large, broad and sharply rounded. **Antirostrum:** Absent. **Excisura:** Moderate, notch very shallow, angle wide.

***Sillago sihama*, SSF No. 198.3 PLATE 68**

**DISTRIBUTION:** Widespread in the Indo-Pacific, reaches as far south as Knysna, quite abundant in Natal estuaries. Attains 30 cm.

**MATERIAL:** 5/20 (4.95-9.2 mm OD, 101-212 mm TL), PEM 4347, 9337, 9343, 9754, 8250 (RUSI 34083); southeastern Cape and Natal; Id. MJS, PCH.

**Otolith shape:** Oblong to rounded triangular. **Thickness:** Thick. **Form:** - **Mesial** convex, - **Lateral** flat. **Dorsal margin:** Slightly rounded; **sculpture**, irregular. **Ventral margin:** Well rounded and slightly irregular or crenate. **Posterior margin:** Sharply rounded and entire or slightly irregular. **Sulcus acusticus:** Ostial, archae-

sulcoid, juveniles (c. 5 mm OD) have slight differentiation of "ostial" region. **Colliculum:** Homomorph, single undifferentiated colliculum. **Pseudocolliculum:** Absent. **Ostium and cauda:** Not differentiated, slightly sinuous sulcus, runs the length of otolith. **Ostio-caudal differentiation:** No constrictions. **Collum:** Absent. **Crista superior:** Poorly developed along entire length of sulcus. **Crista inferior:** Poorly developed along entire length of sulcus. **Dorsal depression:** Oblong, lies close to margin, area reduced. **Ventral depression:** Absent, area rounded and smooth. **Rostrum:** Short, broad and rounded. **Antirostrum:** Absent. **Excisura:** Narrow, notch absent.

**MALACANTHIDAE Nelson No. 300**

**Family characteristics:** Four species available. Oval-ovate up to c. 10.4 mm OD. Heterosulcoid, opening ostial, sulcus deep (except juveniles). Cauda flared, flexed and deep. Development of colliculi varies. Dorsal area distinctly depressed above distinct ridge of crista superior.

**Key**

- 1a. Otolith elongate ovate; ventral margin of otolith slightly rounded; rostrum large and blunt or sharply rounded. .... 2
- 1b. Otolith oval or oval-ovate; ventral margin of otolith rounded; rostrum broad and rounded with pointed tip . . . 3
- 2a. Cauda deep, posterior tip of cauda deep and distinct; dorsal and ventral depressions distinct; margins of otolith crenate or irregular . . . *Malacanthus brevisrostris* 197.4
- 2b. Cauda shallow with tip of cauda poorly defined; dorsal and ventral depressions relatively shallow; margins of otolith highly irregular to digitate . . . . . *Malacanthus latovittatus* 197.5
- 3a. Crista inferior well developed under ostium, ridge-like under cauda; rostrum moderate, broad and sharply rounded; dorsal depression deep . . . . . *Branchiostegus doliatus* 197.1
- 3b. Cristae superior poorly developed under ostium, well developed under cauda; rostrum large, broad and pointed; dorsal depression shallow . . . . . *Branchiostegus sawakinensis* 197.2

***Branchiostegus doliatus*, SSF No. 197.1 PLATE 68**

**DISTRIBUTION:** Known from Maputo to Durban, Mauritius and Reunion. Attains 40 cm.

**MATERIAL:** 3/3 (5.9-10.4 mm OD, 186-381 mm TL), PEM 8827 (RUSI 37425), 14978 (RUSI 35547), 14979 (RUSI 35548); Transkei and Kosi Bay; Id. MJS, MEA.

**Otolith shape:** Oval to ovate. **Thickness:** Moderate. **Form:** - **Mesial** slightly convex, - **Lateral** approximately flat. **Lateral surface:** May have groove and knob under excisura. **Dorsal margin:** Rounded; **sculpture**, very irregular or crenate. **Ventral margin:** Rounded and crenate to irregular. **Posterior margin:** Sharply rounded and crenate to irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Homomorph, indistinct anterior colliculum, no visible posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Flared dorsally, very deep, particularly in large otoliths. **Cauda:** Very deep, ridge across cauda at flexion, deepening further at tip in large otoliths (c. 9 mm OD). Small otoliths (c. 6 mm OD) have shallower sulcus and no ridge across flexion. **Ostio-caudal differentiation:** Ventrally constricted, dorsal constriction more pronounced with growth. **Ostium/cauda:** 1:1.2, 1:1.4, 1:1.2. **Collum:** Absent, area between ostium and cauda slightly raised. **Crista superior:** Well developed or ridge-like over anterior ostium, ridge-like to flexion, well developed over posterior cauda. **Crista inferior:** Well developed under ostium, ridge-like under cauda. **Dorsal depression:** Oval, deep



and striated. Large otoliths have very rugose area above depression. **Ventral depression:** Absent. In large otoliths, narrow groove under crista and wide, shallow groove near margin under ostium to neck. **Rostrum:** Moderate, broad and sharply rounded. **Antirostrum:** Very small and rounded becoming broad and pointed with growth. **Excisura:** Moderate, notch shallow, but deep in large otoliths (c. 9 mm OD), angle wide becoming acute with growth.

***Branchiostegus sawakinensis*, SSF No. 197.2 PLATE 68**

**DISTRIBUTION:** In this area known only off Durban in 45-150 m; also recorded from Red Sea. Attains 60 cm.

**MATERIAL:** 1/1 (7.5 mm OD, 281 mm TL), PEM 5977; Natal.

**Otolith shape:** Oval. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Lateral surface:** Shallow groove under excisura. **Dorsal margin:** Rounded; sculpture, dentate or irregular. **Ventral margin:** Rounded, irregular to dentate. **Posterior margin:** Rounded and dentate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph with very low, oval anterior colliculum; posterior extremely low, ventral margin raised. **Pseudocolliculum:** Absent. **Ostium:** Slightly flared and oval. **Cauda:** Straight, slightly flexed and flared, deep at posterior end. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:1.3. **Collum:** Absent. **Crista superior:** Well developed over ostium, ridge-like elsewhere. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Oval with striations. **Ventral depression:** Absent, shallow groove at margin. **Rostrum:** Large, broad and pointed. **Antirostrum:** Small, broad and sharply rounded. **Excisura:** Moderate, notch shallow, angle wide.

***Malacanthus brevirostris*, SSF No. 197.4 PLATE 68**

**DISTRIBUTION:** Tropical Indo-Pacific species occurring from Red Sea to eastern Pacific; adults extend south to Sodwana Bay. Attains 30 cm.

**MATERIAL:** 3/8 (3.2-4.0 mm OD, 219-257 mm TL), PEM 6756 (RUSI 28363), 5983, 5994, [6690 (RUSI 34079), 8793 (RUSI 37468)]; Natal; Id. MJS, PCH.

**Otolith shape:** Elongate ovate. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Slightly rounded; sculpture, crenate or irregular. **Ventral margin:** Slightly rounded and crenate or irregular. **Posterior margin:** Sharply rounded and irregular, may be notched. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** No raised colliculi. **Pseudocolliculum:** Absent. **Ostium:** Deep, flares ventrally. **Cauda:** Deeper than ostium, gently flexed. **Ostio-caudal differentiation:** Slight dorso-ventral constrictions. **Ostium/cauda:** 1:2, 1:1.1, 1:1. **Collum:** Absent, area between ostium and cauda slightly raised. **Crista superior:** Ridge-like from antirostrum to flexion. **Crista inferior:** Ridge-like under ostium, well developed under cauda. **Dorsal depression:** Elongate above crista. **Ventral depression:** Elongate depression along rostrum under crista, becoming shallow posteriorly. Groove near margin from neck to caudal tip. **Rostrum:** Large and sharply rounded. **Antirostrum:** Large and sharply rounded. **Excisura:** Wide, notch deep, angle acute.

***Malacanthus latovittatus*, SSF No. 197.5 PLATE 69**

**DISTRIBUTION:** Indo-West Pacific from Red Sea to Hawaii. In this area, south to Maputo. Attains 35 cm.

**MATERIAL:** 1/1 (4.35 mm OD, 347 mm TL), PEM 15479 (RUSI 40624); Sodwana Bay; Id. SAC, MJS.

**Otolith shape:** Elongate ovate. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral concave. **Dorsal margin:** Slightly rounded; sculpture, digitate. **Ventral margin:** Slightly rounded, very irregular. **Posterior margin:** Sharply rounded and

irregular to digitate. **Sulcus acusticus:** Ostial, may appear ostio-caudal, heterosulcoid. **Colliculum:** Heteromorph, colliculi low and indistinct. **Pseudocolliculum:** Absent. **Ostium:** Flared, lies mainly on rostrum, undercuts dorsal area. **Cauda:** Straight then flared and flexed near tip, undercuts ventral area. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.7. **Collum:** Absent. **Crista superior:** Ridge-like from ostium to flexion, poorly developed after flexion. **Crista inferior:** Ridge-like from ostium to flexion, well developed from flexion to tip. **Dorsal depression:** Elongate and moderately deep. **Ventral depression:** Groove-like under crista, joins shallow groove in mid-area, margin slightly depressed. **Rostrum:** Large, moderately broad and blunt. **Antirostrum:** Moderately large, tapering and pointed, overhangs excisura. **Excisura:** Wide, notch deep, angle acute.

**POMATOMIDAE Nelson No. 303  
(SCOMBROPIDAE in SSF)**

**Family characteristics:** Only one species. Otoliths oblong to ovate up to c. 16 mm OD. Heterosulcoid, ostial opening. Cauda straight, strongly flexed at tip. Heteromorph, slightly raised anterior, indistinct posterior colliculum. Ventral area moderately wide.

***Scombrops boops*, SSF No. 177.1 PLATE 69**

**DISTRIBUTION:** From the Cape to Delagoa Bay. Attains 60 cm.

**MATERIAL:** 7/19 (1.7-c. 15.8 mm OD, 34-467 mm TL), PEM 2568, 2567, 4456, 2236, 12561, 12637, 15030 (RUSI 35542); Cape south coast; Id. MJS, PCH.

**Otolith shape:** Oblong to ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded; sculpture, crenate as juvenile (<8 mm OD), becoming irregular. **Ventral margin:** Rounded becoming angular; crenate in small otoliths, irregular in large. **Posterior margin:** Sharply rounded and irregular to dentate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior colliculum slightly raised, oval and uneven, extending into neck; indistinct, low posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Approximately oval to elongate. **Cauda:** Approximately straight, ventrally flexed near tip with steep walls. **Ostio-caudal differentiation:** Dorso-ventrally constricted, dorsal constriction right-angled. **Ostium/cauda:** 1:1.3, 1:1.5, 1:1.6, 1:1.6, 1:1.7, 1:1.7, (4456 broken). **Collum:** Absent, no step. **Crista superior:** Poorly developed over ostium, ridge-like over cauda, well developed at tip. **Crista inferior:** Moderately well developed under anterior ostium, well developed along cauda. **Dorsal depression:** Approximately oval, shallow and large. **Ventral depression:** Absent. **Rostrum:** Large and sharply rounded. **Antirostrum:** Moderate and pointed. **Excisura:** Moderately wide, notch shallow, deepens with growth, angle acute.

**POMATOMIDAE Nelson No. 303**

**Family characteristics:** Only one species. Otoliths elongate, rounded fusiform up to c. 17.1 mm OD. Heterosulcoid, opening ostial. Cauda straight, gently flexed towards tip. Heteromorph, low anterior and indistinct posterior colliculum. Dorsal area moderately reduced.

***Pomatomus saltatrix*, SSF No. 178.1 PLATE 69**

**DISTRIBUTION:** A single species in all oceans (except eastern Pacific) between 50° latitudes. Attains 1 m.

**MATERIAL:** 8/130 (3.06-17.1 mm OD, 59-1080 mm TL), PEM 4327 (RUSI 13267), 3587 (RUSI 11933), 3586 (RUSI 11933), 1541, 1852, 5727, 1971, 6039; Cape south coast; Id. MJS, GJBR, PCH.

**Otolith shape:** Rounded fusiform. **Thickness:** Moderately thin. **Form:** - Mesial approximately flat in juv., slightly convex in larger



otoliths, - **Lateral** flat in juv., becoming slightly concave. **Dorsal margin**: Approximately flat; **sculpture**, crenate as juv. (<c. 6 mm OD), irregular or lobed in large otoliths. **Ventral margin**: Slightly rounded and dentate or digitate, crenate in small otoliths. **Posterior margin**: Rounded, irregular to dentate in large, crenate as juv. **Sulcus acusticus**: Ostial, heterosulcoid. **Colliculum**: Heteromorph, anterior very low, surface slightly irregular; posterior extremely low, indistinct, may not be visible. **Pseudocolliculum**: Absent. **Ostium**: Approximately oval, slightly flared dorsally. **Cauda**: Long and narrow, gently flexed ventrally towards tip, ending close to margin. **Ostio-caudal differentiation**: Slight dorso-ventral constrictions. **Ostium/cauda**: 1:1.1, 1:1.1, 1:1.3, 1:1.1, 1:1.3, 1:1.6, 1:1.6, 1:1.6. **Collum**: Absent, no step. **Crista superior**: Very poor over anterior ostium, well developed becoming ridge-like over cauda, well developed from flexion. **Crista inferior**: Poorly developed under ostium, well developed under cauda, becoming ridge-like in large otoliths (c. 15 mm OD). **Dorsal depression**: Elongate over cauda, deep in large otoliths, dorsal area reduced. **Ventral depression**: Narrow and shallow under cauda, area moderately reduced. **Rostrum**: Large, broad and rounded, juv. more pointed (<c. 6 mm OD). **Antirostrum**: Small and pointed in juv., broad and more square in large. **Excisura**: Wide, notch shallow, deepening with growth, angle wide.

### RACHYCENTRIDAE Nelson No. 304

**Family characteristics**: Only one species. Otoliths oblong to fusiform, up to at least 9.3 mm OD. Heterosulcoid with ostial opening. Sulcus extremely deep, ostium narrow, cauda strongly recurved. No raised colliculi (termed scombroid by some authors). Rostrum elongate and pointed, dorsal area reduced.

#### *Rachycentron canadum*, SSF No. 212.1 PLATE 69

**DISTRIBUTION**: Warm waters of the Mediterranean, Atlantic and Indo-Pacific (not in eastern Pacific). Attains c. 2 m, 50 kg. **MATERIAL**: 4/11 (7.14-9.28 mm OD, 620-845 mm TL, 1348H not measured), PEM 2699, 3870, 0693, 1384H; Durban, Algoa Bay and Sodwana Bay; Id. RvdE, GJBR, MJS.

**Otolith shape**: Oblong to fusiform. **Thickness**: Moderate. **Form**: - **Mesial** convex, - **Lateral** concave. **Dorsal margin**: Flat, raised slightly posteriorly; **sculpture**, irregular. **Ventral margin**: Slightly rounded and crenate or irregular. **Posterior margin**: Blunt and crenate or irregular. **Sulcus acusticus**: Ostial, heterosulcoid. **Colliculum**: No raised colliculi (termed scombroid by some authors). **Pseudocolliculum**: Absent. **Ostium**: Elongate and striated, deep, V-shaped in cross section. **Cauda**: Deep, straight then strongly recurved and flared near tip, undercuts ventral area. Walls striated, V-shaped cross section. **Ostio-caudal differentiation**: Slight dorsal constriction. **Ostium/cauda**: 1:1.1, 1:0.7, 1:0.8, 1:1. **Collum**: Absent, anterior cauda slightly raised. **Crista superior**: Ridge-like from ostium to cauda, well developed from flexion. **Crista inferior**: Well developed along entire sulcus, walls steep. **Dorsal depression**: Narrow and elongate, dorsal area reduced. **Ventral depression**: Absent. **Rostrum**: Narrow and pointed. **Antirostrum**: Narrow, pointed. **Excisura**: Wide, notch moderately deep undercutting dorsal area, angle acute.

### ECHENEIDIDAE Nelson No. 305

**Family characteristics**: Otolith shape notched rectangular, or ovate and small, up to c. 2.9 mm OD. Heterosulcoid but differentiation poor. Either ostio-caudal or ostial openings. Sulcus relatively deep, ostium slightly flared. Cauda may be straight or slightly flexed, may have rounded tip. Colliculi either not visible (but sulcus has pitted floor), or heteromorph with low, fused and irregular colliculi. Dorsal and ventral areas usually reduced.

### Key

- 1a. Dorsal margin of otolith rounded; otolith short (oval to ovate) . . . . . *Remora brachyptera* 213.4
- 1b. Dorsal margin of otolith emarginate anteriorly, raised posteriorly; otolith relatively elongate (ovate or rectangular) . . . . . 2
- 2a. Sulcus opening ostio-caudal (caudal opening may be slit-like); cauda slightly flexed; dorsal area extremely reduced with deep groove; posterior margin of otolith may be notched . . . . . *Echeneis naucrates* 213.1
- 2b. Sulcus opening ostial; cauda distinctly flexed; dorsal area somewhat reduced with moderate groove above crista superior; posterior margin of otolith rounded, not notched . . . . . *Remora remora* 213.5

#### *Echeneis naucrates*, SSF No. 213.1 PLATE 70

**DISTRIBUTION**: The most abundant of the remoras, in all warm waters (but not eastern Pacific). Attains 90 cm.

**MATERIAL**: 3/5 (1.95-2.9 mm OD, 550-801 mm TL), 0730H, PEM 8495, 8293, [14580 (RUSI 31418)]; Sodwana Bay and Kosi Bay; Id. PCH.

**Otolith shape**: Deeply notched rectangle. **Thickness**: Moderately thick. **Form**: - **Mesial** convex, - **Lateral** flat. **Dorsal margin**: Emarginate anteriorly, raised posteriorly; **sculpture**, irregular. **Ventral margin**: Slightly rounded and irregular. **Posterior margin**: Rounded, notched and irregular. **Sulcus acusticus**: Ostio-caudal, heterosulcoid, poorly differentiated. **Colliculum**: Heteromorph, fused very low, nodular colliculi. **Pseudocolliculum**: Absent. **Ostium**: Deep, flared and forked. **Cauda**: Anterior cauda shallow, flaring and deepening posteriorly. **Ostio-caudal differentiation**: Slight dorsal constriction. **Ostium/cauda**: 1:1.5, 1:1.9, 1:1.5. **Collum**: Absent, no step but anterior cauda slightly raised. **Crista superior**: Ridge-like along entire sulcus. **Crista inferior**: Well developed along entire sulcus, may be ridge-like. **Dorsal depression**: Deep, groove-like, dorsal area extremely reduced. **Ventral depression**: May be present, very shallow, groove may be deep, extending along ventral area. **Rostrum**: Elongate and pointed, **pseudo-rostrum**: Large and sharply rounded or elongate and pointed. **Antirostrum**: Large, narrow and pointed, **pseudo-antirostrum**: Broad and sharply rounded. **Excisura**: Wide, notch deep, angle acute.

#### *Remora brachyptera*, SSF No. 213.4 PLATE 70

**DISTRIBUTION**: Worldwide. Attains 30 cm.

**MATERIAL**: 2/2 (1.7, 2.2 mm OD, 140, 173 mm TL), PEM 14808, 14807 (both RUSI 30395); Sodwana; Id. RvdE, PCH.

**Otolith shape**: Oval to ovate. **Thickness**: Moderate (for their size). **Form**: - **Mesial** slightly convex, - **Lateral** flat. **Dorsal margin**: Rounded; **sculpture**, very irregular. **Ventral margin**: Slightly rounded and irregular. **Posterior margin**: Sharply rounded and irregular. **Sulcus acusticus**: Ostial, heterosulcoid. **Colliculum**: No raised colliculi, floor of sulcus pitted. **Pseudocolliculum**: Absent. **Ostium**: Flared dorsally and deep. **Cauda**: Slightly angled and flared ventrally, deep. **Ostio-caudal differentiation**: Slight dorsal constriction. **Ostium/cauda**: 1:2.4, 1:2.2. **Collum**: Absent. **Crista superior**: Ridge-like along entire sulcus. **Crista inferior**: Well developed, ridge-like at tip. **Dorsal depression**: Oval or elongate, deep, may cover most of area. **Ventral depression**: Oval under neck, very uneven. **Rostrum**: Large, broad and sharply rounded. **Antirostrum**: Large, broad, pointed or hooked. **Excisura**: Wide, notch deep, angle wide.

#### *Remora remora*, SSF No. 213.5 PLATE 70

**DISTRIBUTION**: Worldwide and common. Attains 62 cm.



**MATERIAL:** 6/9 (0.9-1.6 mm OD, 88-166 mm TL, 0035 not measured), PEM 14833, 14835, 14837, 14836, 14834 (all RUSI 37088), 0035, [1962-1964 (RUSI 10428), 15474 (RUSI 40626)]; Natal and south of Cape Recife, Cape south coast; Id. MJS, PCH.

**Otolith shape:** Ovate. **Thickness:** Moderately thick for size. **Form:** - Mesial slightly convex, - Lateral flat. **Dorsal margin:** Flat to slightly emarginate, slightly raised posteriorly; **sculpture,** slightly irregular. **Ventral margin:** Slightly rounded and approximately entire, dentate in large otoliths (c. 1.6 mm OD). **Posterior margin:** Rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, fused colliculi, low and irregular. **Pseudocolliculum:** Absent. **Ostium:** Deep, flared anteriorly, V-shaped in neck. **Cauda:** Approximately straight, flexed and deep at tip. **Ostio-caudal differentiation:** Slight dorsal constriction. **Ostium/cauda:** 1:2, 1:2, 1:1.4, 1:1.1, 1:1.4, 1:1.6. **Collum:** Absent, step up to cauda. **Crista superior:** Ridge-like, well developed after flexion; in small otoliths (c. 0.9 mm OD) crista well developed along entire sulcus. **Crista inferior:** Ridge-like. **Dorsal depression:** Moderately deep and elongate along crista, dorsal area somewhat reduced. **Ventral depression:** Absent, groove below crista, ventral area below is uneven. **Rostrum:** Moderately large and pointed. **Antirostrum:** Moderately elongate and pointed. **Excisura:** Wide, notch deep, angle approximately acute.

**CARANGIDAE Nelson No. 306**

**Family characteristics:** Otoliths of this family are variable in shape. Most species are oval to oblong or elongate fusiform. One is anvil-shaped. Largest otoliths up to at least 17 mm OD. All are heterosulcoid and most openings are ostial, a few are ostio-caudal. Most are heteromorph but some are homomorph with only the posterior colliculum visible. In all species the colliculi are very low and generally indistinct. Ostium is oval or spear-shaped, in some becoming narrow, reduced and elongate. Cauda is usually flexed and deepening at tip.

**NOTE:** Differences between these otoliths are subtle. As a guide to identifications, a list of key features separating groups of species with similar looking otoliths is provided. Juveniles of this family are particularly difficult to differentiate from each other. It may be possible to develop a key with additional material from large fish.

**Key features**

- 1. Otolith anvil shaped; ostium and cauda barely differentiated; obviously ostio-caudal and deeply notched . . . . . *Naucratis ductor* 210.35
- 2. Otolith oblong; dorsal area very reduced; sulcus covers c. 50% of otolith width; groove under crista inferior . . . . . *Elagatis bipinnulata* 210.31
- 3. Otolith oval to approximately oblong; distinct anterior colliculum penetrates excisura; strongly flexed cauda . . . . . *Selar crumenophthalmus* 210.41
- 4. Otolith oval to oblong; ostium small and oval; cauda sinuous, not deep, narrows to tip . . . . . *Chloroscombrus chrysurus* 210.24
- 5. Otolith rounded-ovate; dorsal margin of rostrum rounded, otherwise like *T. botla* . . . . . *Trachinotus africanus* 210.47
- 6. Otolith ovate to fusiform; rostrum markedly elongate but broad; antirostrum broad or raised; cauda slightly flexed ventrally . . . . . *Alectis ciliaris* 210.1; *A. indicus* 210.2
- 7. Otolith approximately oval or oblong becoming elongate and approximately fusiform; antirostrum very small; ostium moderately short; cauda long and narrow (not flared) and either slightly or strongly flexed but not very deep; ventral margin rounded : *Decapterus russelli*

- 210.29; *Parastromateus niger* 210.36; *Trachurus delagoa* 210.51; *Trachurus trachurus* 210.52
- 8. Otolith approximately oval, oblong or ovate becoming fusiform; rostrum large may be broad and pointed; cauda flexed, deepens and flares near tip and often undercuts ventral margin: *Alepes djedaba* 210.3; *Atule mate* 210.4; *Carangoides caeruleopinnatus* 210.6; *C. equula* 210.9; *C. fulvoguttatus* 210.11; *C. gymnotethus* 210.12; *C. malabaricus* 210.14; *Caranx ignobilis* 210.17; *C. melanopygus* 210.19; *C. papuensis* 210.20; *C. sem* 210.21; *C. sexfasciatus* 210.22; *Decapterus macarellus* 210.26; *D. macrosoma* 210.27; *Gnathanodon speciosus* 210.32; *Megalaspis cordyla* 210.34; *Pseudocaranx dentex* 210.37
- 9. Otolith fusiform and elongate (small otoliths may be oblong); rostrum elongate and narrow; antirostrum small; cauda slightly flexed, flared at tip; ventral margin of otolith notched; ventral area reduced; sulcus may be ostio-caudal: *Scomberoides commersonnianus* 210.38; *S. lysan* 210.39; *S. tol* 210.40; *Seriola lalandi* 210.44; *S. rivoliana* 210.45.
- 10. Otolith fusiform; rostrum arrowhead-like; dorsal margin notched; cauda deep; ostium broad . . . . . *Trachinotus botla* 210.50
- 11. Otolith fusiform; rostrum broad and pointed; antirostrum very broad; sulcus barely flexed . . . . . *Seriolina nigrofasciata* 210.46
- 12. Otolith fusiform; rostrum markedly elongate; cauda straight, not flexed ventrally . . . *Lichia amia* 210.33

**Alectis ciliaris, SSF No. 210.1 PLATE 70**

**DISTRIBUTION:** Algoa Bay northwards; a circumtropical species. Attains at least 130 cm FL.

**MATERIAL:** 4/5 (1.7-4.2 mm OD, 73-246 mm TL), PEM 13442, 0069, 6757 (RUSI 28388), 15471 (RUSI 40622); Durban, ORI and Algoa Bay; Id. RvdE, GJBR, MJS, PCH.

**Otolith shape:** Ovate to fusiform. **Thickness:** Moderate. **Form:** - Mesial flat, - Lateral flat. **Dorsal margin:** Slightly rounded; **sculpture,** irregular. **Ventral margin:** Slightly rounded or flattened and irregular. **Posterior margin:** Sharply rounded, becoming blunt and notched with growth, sculpture irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, slightly raised, uneven anterior colliculum lying along rostrum; posterior very low and indistinct. **Pseudocolliculum:** Absent. **Ostium:** Flared dorsally, shallow. **Cauda:** Moderately long, slightly flexed posteriorly and shallow. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:1.5, 1:1.4, 1:1.1, (13442 broken). **Collum:** Absent, slight step to cauda. **Crista superior:** Ridge-like over ostium, well developed over cauda with gap at neck, poorly developed at caudal tip. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Absent, area uneven. **Ventral depression:** Absent. **Rostrum:** Large, becomes elongate and pointed. **Antirostrum:** Short, broad and rounded. **Excisura:** Wide, notch shallow, angle wide.

**Alectis indicus, SSF No. 210.2 PLATE 70**

**DISTRIBUTION:** Durban northward; widespread throughout Indian Ocean and eastward to Ryukyu Ids and Australia. Attains 150 cm FL.

**MATERIAL:** 2/7 (2.45, 6.0 mm OD, 127, 345 mm TL), PEM 12446, 6760; ORI and Jeffreys Bay; Id. RvdE, MJS.

**Otolith shape:** Ovate in juvenile, becoming fusiform (c. 6 mm OD). **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Juveniles slightly rounded and irregular, becoming raised anteriorly and flattened posteriorly, crenate. **Ventral margin:** Slightly rounded and



irregular becoming crenate with growth. **Posterior margin:** Juveniles blunt, becoming sharply rounded, sculpture irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, very low and fused, if visible. **Pseudocolliculum:** Absent. **Ostium:** Moderately deep, V-shaped at neck. **Cauda:** Approximately straight, slightly flexed and flared at tip, moderately deep. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1, (12446 broken). **Collum:** Present, low, wall-like reaches half way up wall. **Crista superior:** Well developed, except caudal tip may be poorly developed. **Crista inferior:** Poorly developed at extremes, well developed elsewhere. **Dorsal depression:** Absent, dorsal area uneven. **Ventral depression:** Absent. **Rostrum:** Large and pointed. **Antirostrum:** Large, broad and blunt in juveniles, becoming narrow and pointed. **Excisura:** Wide, notch deep, angle acute.

#### *Alepes djedaba*, SSF No. 210.3 PLATE 70

**DISTRIBUTION:** Durban northward throughout Indian Ocean; a recent immigrant to eastern Mediterranean from the Red Sea via the Suez Canal. Attains 34 cm FL.

**MATERIAL:** 1/1 (4.4 mm OD, 162 mm TL), PEM 6717 (RUSI 28387); ORI; Id. PCH.

**Otolith shape:** Oblong to fusiform. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Slightly rounded; **sculpture**, crenate. **Ventral margin:** Slightly rounded and crenate. **Posterior margin:** Sharply rounded and crenate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, extremely low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Narrow, flared dorsally, moderately deep, V-shaped at neck. **Cauda:** Narrow and long, slightly flared and deep at tip. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:1.3. **Collum:** Absent, step up to cauda. **Crista superior:** Well developed over anterior ostium, ridge-like over cauda, poorly developed at tip. **Crista inferior:** Poorly developed under anterior ostium, well developed elsewhere. **Dorsal depression:** Oval and shallow. **Ventral depression:** Absent. **Rostrum:** Large and pointed. **Antirostrum:** Small and pointed. **Excisura:** Wide, notch shallow, angle acute.

#### *Atule mate*, SSF No. 210.4 PLATE 70

**DISTRIBUTION:** Mozambique northward, widespread in Indo-West Pacific, eastward to Hawaiian Ids. Attains 30 cm FL.

**MATERIAL:** 1/2 (5.22 mm OD, 218 mm TL), PEM 0404; Durban; Id. RvdE.

**Otolith shape:** Fusiform. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral approximately flat. **Dorsal margin:** Slightly rounded posteriorly, flat anteriorly; **sculpture**, irregular. **Ventral margin:** Slightly rounded and crenate. **Posterior margin:** Sharply rounded and irregular. **Sulcus acusticus:** Ostial, may appear ostio-caudal, heterosulcoid. **Colliculum:** No raised colliculi. **Pseudocolliculum:** Absent. **Ostium:** Predominantly on the rostrum, slightly flared dorsally, elongate, floor uneven. **Cauda:** Narrow and long, very sharply flexed, indistinct at tip, ending near margin. **Ostio-caudal differentiation:** Dorsally constricted. **Ostium/cauda:** 1:0.8. **Collum:** Absent. **Crista superior:** Well developed over ostium, ridge-like from neck to flexion, absent at caudal tip. **Crista inferior:** Poorly developed under ostium and caudal tip, well developed elsewhere. **Dorsal depression:** Oval and very shallow. **Ventral depression:** Absent, shallow and short groove from caudal tip, at margin. **Rostrum:** Long, narrow and pointed. **Antirostrum:** Narrow and pointed. **Excisura:** Wide, notch moderate, angle acute.

#### *Carangoides caeruleopinnatus*, SSF No. 210.6

##### PLATE 70

**DISTRIBUTION:** Durban northward and eastward to Japan and Australia. Attains 40 cm FL.

**MATERIAL:** 1/1 (5.9 mm OD, 317 mm TL), PEM 8620; Kosi Bay.

**Otolith shape:** Bluntly fusiform. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Slightly rounded, raised posteriorly; **sculpture**, irregular. **Ventral margin:** Slightly rounded and crenate or irregular. **Posterior margin:** Sharply rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Homomorph, single indistinct posterior colliculum. No anterior colliculum visible in ostium. **Pseudocolliculum:** Absent. **Ostium:** Spear-shaped, lies mainly along rostrum, floor smooth, flared dorsally. **Cauda:** Straight, flares very slightly then narrows before flexion, deep, caudal tip undercuts ventral area. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:0.9. **Collum:** Absent, step up to cauda. **Crista superior:** Ridge-like from ostium to flexion, poorly developed after flexion. **Crista inferior:** Poorly developed under ostium, ridge-like under cauda, well developed at tip. **Dorsal depression:** Elongate and approximately rounded triangular. **Ventral depression:** Absent, slight groove near margin, may be depressed notch posterior to caudal tip. **Rostrum:** Large and pointed. **Antirostrum:** Moderate and pointed. **Excisura:** Wide, notch deep, angle acute.

#### *Carangoides equula*, SSF No. 210.9 PLATE 71

**DISTRIBUTION:** Algoa Bay northward, also off Somalia, Gulf of Oman, Japan, Australia, New Zealand, Hawaii and Easter Is. Attains 37 cm FL.

**MATERIAL:** 2/2 (2.7, 2.8 mm OD, 101, 106 mm TL), PEM 14380 (RUSI 34130), 12569 (RUSI 28370); Cape south coast; Id. MJS, PCH.

**Otolith shape:** Oval to ovate. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral flat. **Dorsal margin:** Slightly rounded; **sculpture**, lobed or irregular. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Sharply rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, extremely low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Flared dorsally, deep, ending in V. **Cauda:** Approximately straight and flexed at tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.2, 1:1.6. **Collum:** Absent, step up to cauda. **Crista superior:** Well developed from ostium along cauda. **Crista inferior:** Poorly developed under ostium and caudal tip, well developed under cauda. **Dorsal depression:** Oval and very shallow. **Ventral depression:** Absent. **Rostrum:** Moderate, broad and pointed. **Antirostrum:** Minute or small and round. **Excisura:** Moderate, notch shallow, angle wide.

#### *Carangoides fulvoguttatus*, SSF No. 210.11 PLATE 71

**DISTRIBUTION:** Durban northward, a widespread Indo-West Pacific species. Attains 100 cm FL.

**MATERIAL:** 2/2 (3.85, 7.44 mm OD, 160, 490 mm TL), PEM 0359, 0451; Mozambique and Natal; Id. RvdE, GJBR.

**Otolith shape:** Fusiform. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Lateral surface:** Two diverging ridges from nucleus to posterior margin. **Dorsal margin:** Slightly rounded; **sculpture**, crenate in small otoliths, irregular in large (c. 7 mm OD). **Ventral margin:** Slightly rounded and crenate to irregular. **Posterior margin:** Sharply rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Homomorph, only indistinct, low posterior colliculum visible. **Pseudocolliculum:** Absent. **Ostium:** Narrow, lies mainly on rostrum, flared



dorsally, ending in V at neck. **Cauda:** Mainly straight, flexed at tip, moderately deep, especially at tip where it undercuts ventral area. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:2.2, 1:1.4. **Collum:** Absent, step up to cauda. **Crista superior:** Narrow ridge along sulcus, well developed at tip. **Crista inferior:** Poorly developed under ostium, well developed elsewhere. **Dorsal depression:** Shallow and oval above cauda. **Ventral depression:** Absent, depression below caudal tip near margin, and shallow groove in ventral area. **Rostrum:** Elongate and pointed. **Antirostrum:** Short and pointed. **Excisura:** Wide, notch shallow, angle acute.

***Carangoides gymnostethus*, SSF No. 210.12 PLATE 71**

**DISTRIBUTION:** Algoa Bay northwards; a widespread Indo-West Pacific species. Attains 90 cm FL.

**MATERIAL:** 1/1 (5.6 mm OD, 345 mm TL), PEM 9584; Algoa Bay; Id. MJS.

**Otolith shape:** Fusiform. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal surface:** Single ridge from nucleus to posterior margin. **Dorsal margin:** Slightly rounded; sculpture, lobed or irregular. **Ventral margin:** Slightly rounded and crenate to dentate under rostrum. **Posterior margin:** Sharply rounded and crenate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, small and very indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Narrow, elongate, along rostrum, V-shaped in neck. **Cauda:** Mainly straight, slightly flexed at tip which is deep and undercuts ventral area. **Ostio-caudal differentiation:** Dorsally constricted. **Ostium/cauda:** 1:1.2. **Collum:** Absent, step to cauda. **Crista superior:** Ridge-like from ostium to flexion, thereafter well developed. **Crista inferior:** Poorly developed under ostium, well developed elsewhere. **Dorsal depression:** Elongate and approximately oval above cauda. **Ventral depression:** Absent; shallow, narrow groove under the cauda. **Rostrum:** Elongate and pointed. **Antirostrum:** Small, broad and blunt. **Excisura:** Wide, notch moderate, angle acute.

***Carangoides malabaricus*, SSF No. 210.14 PLATE 71**

**DISTRIBUTION:** Durban northward in tropical coastal waters of Indo-West Pacific. Attains 28 cm FL.

**MATERIAL:** 3/3 (4.65-5.34 mm OD, 192-219 mm TL), PEM 3933, 3931, 3932; Durban; Id. PCH.

**Otolith shape:** Fusiform. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral concave. **Dorsal margin:** Rounded; sculpture, lobed or very irregular. **Ventral margin:** Rounded and crenate to irregular. **Posterior margin:** Sharply rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, small anterior, low and indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Mainly on rostrum, approximately spear-shaped and flared dorsally. **Cauda:** Approximately straight, slightly flared and flexed at tip, deeper posteriorly where it undercuts the ventral area. **Ostio-caudal differentiation:** Dorsally constricted. **Ostium/cauda:** 1:1.2, 1:1.1, 1:1. **Collum:** Absent, slight step to cauda. **Crista superior:** Narrow ridge from ostium to flexion, well developed at tip. **Crista inferior:** Poorly developed under ostium, well developed elsewhere. **Dorsal depression:** Oval and shallow. **Ventral depression:** Absent. **Rostrum:** Elongate and pointed. **Antirostrum:** Short, sharply rounded and irregular. **Excisura:** Wide, notch shallow, angle acute.

***Caranx ignobilis*, SSF No. 210.17 PLATE 71**

**DISTRIBUTION:** Widespread in Indo-West Pacific from Algoa Bay northward, eastward to Hawaiian and Marquesas Ids. Common to c. 100 cm FL, attains 165 cm FL.

**MATERIAL:** 5/11 (3.54-17.2 mm OD, 165-1315 mm TL), PEM 0305, 15450 (RUSI 40568), 0391, 7451, 7443; Kosi Bay, Durban and Algoa Bay. Id. RvdE, MJS, MMS, PCH.

**Otolith shape:** Approximately oval (c. 6 mm OD), becoming fusiform (c. 12 mm OD). **Thickness:** Moderate. **Form:** - Mesial convex, flatter in juveniles, - Lateral concave. **Dorsal surface:** Dorsal wing in large otoliths. **Dorsal margin:** Slightly rounded becoming more notched with growth; sculpture, irregular becoming dentate. **Ventral margin:** Slightly rounded and crenate in juveniles, becoming irregular with growth. **Posterior margin:** Sharply rounded and crenate. **Sulcus acusticus:** Ostial, becoming ostio-caudal with growth (c. 17 mm OD), heterosulcoid. **Colliculum:** Heteromorph, extremely low colliculi may be visible. **Pseudocolliculum:** Absent. **Ostium:** Broad in juv. becoming elongate (c. 12 mm OD), dorsal margin hooked and curved, most of its area on rostrum. **Cauda:** Gently curved posteriorly, ventral margin sinuous, deep posteriorly, undercutting ventral area, may open to margin (c. 17 mm OD). **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1, 1:1, 1:1.2, 1:1.4, 1:1.1. **Collum:** Absent, step to cauda. **Crista superior:** Well developed along steep-walled sulcus, may be poorly developed at tip. **Crista inferior:** Poorly developed under ostium (< 5 mm OD), becoming ridge-like. Well developed under cauda (c. 5 mm OD), becoming ridge-like. **Dorsal depression:** Oval above anterior cauda in juv., over posterior cauda in large otoliths (>12 mm OD). **Ventral depression:** Oval to elongate. From caudal tip to neck (<5 mm OD), to end of rostrum in larger otoliths. **Rostrum:** Broad in juveniles, becoming elongate with growth, tip pointed. **Antirostrum:** If present, moderate and pointed. **Excisura:** Wide, notch moderate, angle acute.

***Caranx melampygus*, SSF No. 210.19 PLATE 71**

**DISTRIBUTION:** Widespread from Natal northward throughout tropical Indo-Pacific to the Americas. Attains 80 cm FL, reported to 100 cm FL.

**MATERIAL:** 1/3 (9.58 mm OD, 534 mm TL), PEM 2724; Sodwana Bay; Id. MJS, MMS.

**Otolith shape:** Oblong to fusiform. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded, raised posteriorly; sculpture, irregular. **Ventral margin:** Rounded and crenate to irregular. **Posterior margin:** Sharply rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, extremely low and indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Wide and heart-shaped narrows at neck, dorsal edge of rostrum raised. **Cauda:** Tail is flexed, deepens posteriorly and undercuts ventral area. **Ostio-caudal differentiation:** Strongly dorso-ventrally constricted. **Ostium/cauda:** 1:1. **Collum:** Absent, step to cauda. **Crista superior:** Well developed at extremes, ridge-like along cauda. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Oval and shallow. **Ventral depression:** Absent, shallow groove from rostrum to caudal tip, where it deepens. **Rostrum:** Large, broad and pointed. **Antirostrum:** Absent. **Excisura:** Moderate, notch absent.

***Caranx papuensis*, SSF No. 210.20 PLATE 71**

**DISTRIBUTION:** Port Alfred northward to Zanzibar, also Madagascar, Mauritius, Seychelles and Sri Lanka. Elsewhere Ryukyu Ids to Australia and eastward to the Marquesas Ids. Attains 80 cm FL.

**MATERIAL:** 1/1 (5.78 mm OD, 247 mm TL), PEM 0397; Durban; Id. RvdE.

**Otolith shape:** Oblong to fusiform. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded; sculpture, irregular. **Ventral margin:** Rounded and crenate. **Posterior margin:** Sharply rounded and crenate. **Sulcus**



**acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, extremely low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Flares dorsally, rostral margin irregular, deepens towards neck. **Cauda:** Approximately straight initially then sharply flexed, deepening at tip and undercutting ventral area. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:0.9. **Collum:** Absent, step up to cauda. **Crista superior:** Well developed above ostium, ridge-like to flexion, poorly developed after flexion. **Crista inferior:** Poorly developed under anterior ostium, well developed elsewhere. **Dorsal depression:** Oval and shallow. **Ventral depression:** Absent. **Rostrum:** Large, broad and pointed. **Antirostrum:** Small and sharply rounded. **Excisura:** Moderate, notch shallow, angle wide.

#### *Caranx sem,* SSF No. 210.21 PLATE 71

**DISTRIBUTION:** Durban northwards to Zanzibar, also Madagascar and Sri Lanka, Okinawa to Australia and Fiji Ids. Attains at least 85 cm FL.

**MATERIAL:** 1/1 (7.66 mm OD, 620 mm TL), PEM 0636; Mapelane; Id. RvdE.

**Otolith shape:** Oblong to fusiform. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Approximately flat; **sculpture,** slightly irregular. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Blunt and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, extremely low, indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Elongate, narrow and deep, lies along the rostrum. **Cauda:** Deep, strongly recurved and flaring at caudal tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.8. **Collum:** Absent. **Crista superior:** Well developed at extremes and ridge-like over anterior cauda, anterior crista overhangs ostium. **Crista inferior:** Poorly developed under ostium, well-developed under cauda. **Dorsal depression:** Elongate and dumbbell shaped. **Ventral depression:** Absent. **Rostrum:** Large, broad and pointed. **Antirostrum:** Small and pointed. **Excisura:** Moderately wide, notch shallow, angle acute.

#### *Caranx sexfasciatus,* SSF No. 210.22 PLATE 71

**DISTRIBUTION:** Widespread in tropical Indo-Pacific from Natal northward and eastward to the Americas. Attains 85 cm FL.

**MATERIAL:** 3/5 (8.5-9.3 mm OD, 513-565 mm TL), PEM 0916 (RUSI 7872), 10485, 8914; Swartkops, Algoa Bay; Id. RvdE, PCH, MJS.

**Otolith shape:** Oblong to fusiform. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Lateral surface:** Dorsal and ventral edges of posterior wall are raised, forming a depression along the centre. **Dorsal margin:** Flattened, raised posteriorly; **sculpture,** irregular. **Ventral margin:** Slightly rounded becoming emarginate at caudal tip and crenate to irregular. **Posterior margin:** Bluntly rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, extremely low and indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Elongate, dorsal edge raised and irregular. **Cauda:** Elongate and narrow, flexed posteriorly where it is deep and undercuts ventral area. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.2 (0916 and 8914 broken). **Collum:** Absent, step up to cauda. **Crista superior:** Ridge-like from ostium to flexion, well-developed after flexion. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Elongate and shallow. **Ventral depression:** Elongate and deep, narrowing anteriorly. **Rostrum:** Moderate or large and sharply rounded to pointed. **Antirostrum:** Absent or large and pointed. **Excisura:** Moderate, notch shallow, angle acute.

#### *Chloroscombrus chrysurus,* SSF No. 210.24 PLATE 71

**DISTRIBUTION:** Occurs on both sides of Atlantic. Common to 22 cm, attains at least 30 cm FL.

**MATERIAL:** 1/1 (3.2 mm OD, TL not measured), PEM 0376; off Ghana; Id. FCS.

**Otolith shape:** Oval to oblong. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded; **sculpture,** crenate. **Ventral margin:** Rounded and crenate. **Posterior margin:** Sharply rounded or blunt and crenate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, extremely low, indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Flared dorsally, deeper than cauda. **Cauda:** Sinuous, flexed at posterior, tip indistinct. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.2. **Collum:** Absent, slight step. **Crista superior:** Well developed above ostium, ridge-like along anterior cauda, well developed over caudal flexion, absent at caudal tip. **Crista inferior:** Poorly developed at extremes, well developed elsewhere. **Dorsal depression:** Oval and shallow. **Ventral depression:** Absent, slight groove from tip of cauda to flexion, deeper posteriorly. **Rostrum:** Broad and sharply rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Moderate, notch very shallow, angle acute.

#### *Decapterus macarellus,* SSF No. 210.26 PLATE 72

**DISTRIBUTION:** Knysna northward; a circumtropical species. Attains 32 cm FL.

**MATERIAL:** 3/3 (c. 5-6.44 mm OD, 257-325 mm TL), PEM 14277 (RUSI 33516), 15677, 15775; Comoro Ids; Id. PCH.

**Otolith shape:** Fusiform. **Thickness:** Moderate. **Form:** - Mesial flat or slightly convex, - Lateral concave. **Dorsal margin:** Slightly rounded; **sculpture,** irregular or crenate. **Ventral margin:** Rounded and crenate. **Posterior margin:** Sharply rounded to pointed and irregular. **Sulcus acusticus:** Ostio-caudal, heterosulcoid. **Colliculum:** Heteromorph, colliculi low. **Pseudocolliculum:** Absent. **Ostium:** Lies mainly on rostrum flared dorsally. **Cauda:** Straight and then flexed and flared posteriorly, narrows and opens at ventral margin, deeper at flexion. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.6, 1:1.8, 14277 broken. **Collum:** Absent. **Crista superior:** Ridge-like along length of sulcus, well developed after flexion. **Crista inferior:** Well-developed along entire sulcus. **Dorsal depression:** Elongate and deep above anterior cauda. **Ventral depression:** Absent, may be very shallow groove in mid-ventral area. **Rostrum:** Large, elongate and pointed. **Antirostrum:** Moderate and sharply rounded to pointed. **Excisura:** Wide, notch moderately deep, angle varies.

#### *Decapterus macrosoma,* SSF No. 210.27 PLATE 72

**DISTRIBUTION:** Widespread in Indo-Pacific from Knysna northward; also in tropical eastern Pacific. Attains 35 cm FL.

**MATERIAL:** 3/4 (1.8-4.1 mm OD, 63-197 mm TL), PEM 7267, 7270, 13071 (RUSI 28371); Bird Is., Algoa Bay and Cape south coast; Id. MJS, PCH.

**Otolith shape:** Approximately oblong. **Thickness:** Moderately thin. **Form:** - Mesial approximately flat, - Lateral slightly concave. **Dorsal margin:** Slightly rounded; **sculpture,** crenate or irregular. **Ventral margin:** Slightly rounded and irregular. **Posterior margin:** Sharply rounded and lobed in large otoliths or irregular. **Sulcus acusticus:** Ostial in juveniles, ostio-caudal in large otoliths (c. 4 mm OD), heterosulcoid. **Colliculum:** Heteromorph, extremely low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Short, broad and shallow. **Cauda:** Straight with slight posterior flexion, extending to margin in large otoliths. **Ostio-caudal differentiation:** Dorsally constricted. **Ostium/cauda:** 1:2.1, 1:2.5, 1:1.5. **Collum:** Absent. **Crista superior:** Well developed



over ostium, ridge-like along anterior cauda, well developed after flexion. **Crista inferior:** Poorly developed under ostium, well-developed under cauda. **Dorsal depression:** Elongate, narrow and shallow. **Ventral depression:** Absent, very shallow groove in mid-ventral area from ostium to caudal flexion. **Rostrum:** Moderate and pointed. **Antirostrum:** Absent or minute, square or sharply rounded. **Excisura:** Moderate, notch very shallow, angle wide.

#### *Decapterus russelli*, SSF No. 210.29 PLATE 72

**DISTRIBUTION:** Durban northward to Japan and Australia. Attains 38 cm FL.

**MATERIAL:** 4/4 (4.05-4.6 mm OD, 147-170 mm TL), PEM 15459, 15456, 15458, 15457 (all RUSI 40556); Durban; Id. PCH.

**Otolith shape:** Oblong to fusiform. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded; **sculpture,** irregular or crenate. **Ventral margin:** Slightly rounded, slightly irregular or crenate. **Posterior margin:** Sharply rounded and crenate. **Sulcus acusticus:** Ostio-caudal, heterosulcoid. **Colliculum:** Heteromorph, colliculi low; posterior colliculum indistinct. **Pseudocolliculum:** Absent. **Ostium:** Oval, slightly flared dorsally. **Cauda:** Straight, flexed near tip, open to ventral margin. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:1.6, 1:1.8, 1:1.7, 1:1.6. **Collum:** Absent, slight step up to cauda. **Crista superior:** Well developed over ostium and after flexion, ridge-like over anterior cauda. **Crista inferior:** Poorly developed under anterior ostium, well developed elsewhere. **Dorsal depression:** Fan-shaped, shallow. **Ventral depression:** Absent, may be a very shallow groove close to margin. **Rostrum:** Moderately small and pointed. **Antirostrum:** Minute and pointed. **Excisura:** Wide, notch very shallow, angle acute.

#### *Elagatis bipinnulata*, SSF No. 210.31 PLATE 72

**DISTRIBUTION:** Durban northward, a circumtropical species but apparently rare in eastern Atlantic Ocean. Attains 120 cm, common to 80 cm FL.

**MATERIAL:** 2/5 (4.95, 6.2 mm OD, 415, 487 mm FL), PEM 2081, 5918; Sodwana Bay; Id. RvdE.

**Otolith shape:** Approximately rectangular. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral slightly concave. **Dorsal margin:** Flat; **sculpture,** irregular. **Ventral margin:** Slightly rounded or flat and crenate or irregular. **Posterior margin:** Pointed and irregular. **Sulcus acusticus:** Ostial or ostio-caudal, heterosulcoid. **Colliculum:** Heteromorph; narrow anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Deep, lying along rostrum. **Cauda:** Straight ventrally, flared slightly dorsally and deeper posteriorly. **Ostio-caudal differentiation:** Slight dorsal constriction. **Ostium/cauda:** 1:1.2, 1:1.2. **Collum:** Absent, anterior cauda slightly raised. **Crista superior:** Ridge-like along entire sulcus. **Crista inferior:** Well-developed under ostium, ridge-like under cauda. **Dorsal depression:** Shallow and elongate groove above crista, area reduced. **Ventral depression:** Absent, wide groove close to margin, for two thirds of otolith length, ventral area reduced. **Rostrum:** Large and pointed or sharply rounded. **Antirostrum:** Small and pointed. **Excisura:** Wide, notch shallow, angle acute.

#### *Gnathanodon speciosus*, SSF No. 210.32 PLATE 72

**DISTRIBUTION:** Tropical Indo-Pacific south to northern Natal and eastward to the Americas. Attains 110 cm FL.

**MATERIAL:** 2/2 (4.9 mm OD, (2722 broken), 285, 449 mm TL), PEM 9597, 2722; Sodwana and Kosi Bays; Id. MJS, MMS.

**Otolith shape:** Fusiform. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Lateral surface:** In large otoliths dorsal and ventral posterior margins raised, curved

in the middle. **Dorsal margin:** Slightly rounded; **sculpture,** irregular. **Ventral margin:** Slightly rounded or flat and crenate, dentate, or irregular. **Posterior margin:** Sharply rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, extremely low, indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Deep, very narrow, lies along rostrum. **Cauda:** Approximately straight, slightly flared at distal flexion, tip deep. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.5, (2722 broken). **Collum:** Absent, step up to cauda. **Crista superior:** Ridge-like over cauda, well developed elsewhere. **Crista inferior:** Poorly developed under ostium, well-developed under cauda, becoming ridge-like at tip. **Dorsal depression:** Shallow above crista. **Ventral depression:** Shallow under flexion, may be irregular. **Rostrum:** Large and sharply rounded. **Antirostrum:** Large and pointed or sharply rounded. **Excisura:** Wide, notch moderate or deep, angle acute.

#### *Lichia amia*, SSF No. 210.33 PLATE 72

**DISTRIBUTION:** Mediterranean Sea southward along entire African coast and around the Cape to Delagoa Bay. Common to 100 cm, reported to attain 180 cm FL.

**MATERIAL:** 4/37 (0.89-9.8 mm OD, 59-1015 mm TL), PEM 1594, 2959, 1140, 14854; Cape south coast; Id. MJS.

**Otolith shape:** Small juvs (0.9 mm OD) rounded, becoming fusiform (>c. 3 mm OD). **Thickness:** Moderate. **Form:** - Mesial flat or slightly convex, - Lateral slightly concave. **Dorsal margin:** Flat or slightly rounded; **sculpture,** crenate or irregular. **Ventral margin:** Approximately flat in larger otoliths (>c. 3 mm OD) and rounded in juvs; slightly irregular. **Posterior margin:** Rounded or pointed and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, indistinct, low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Covers most of rostrum in large otoliths, approximately flat. **Cauda:** Approximately straight, angled and flared dorsally, not distinctly closed. **Ostio-caudal differentiation:** Dorsally constricted. **Ostium/cauda:** 1:1.2, 1:1, 1:1, 1:1.1. **Collum:** Absent. **Crista superior:** Well developed over entire sulcus, absent at tip. **Crista inferior:** Poorly developed under ostium and caudal tip, well developed or low ridge under cauda. **Dorsal depression:** Shallow, lying over dorsal crista, variable in shape. **Ventral depression:** Absent, may be groove present under crista. **Rostrum:** Very elongate and pointed. **Antirostrum:** Moderate, broad and sharply rounded or blunt. **Excisura:** Wide, notch moderate, angle acute.

#### *Megalaspis cordyla*, SSF No. 210.34 PLATE 73

**DISTRIBUTION:** East London northward; tropical Indo-West Pacific, to Japan and Australia. Attains 80 cm FL.

**MATERIAL:** 3/4 (3.25-6.36 mm OD, 174-315 mm TL), PEM 3929, 6591, 0357; off Durban; Id. PCH, MMS.

**Otolith shape:** Fusiform. **Thickness:** Moderately thin. **Form:** - Mesial convex, - Lateral concave. **Lateral surface:** Groove near ventral margin in large otoliths only. **Dorsal margin:** Slightly rounded; **sculpture,** irregular. **Ventral margin:** Slightly rounded and slightly irregular, crenate posteriorly. **Posterior margin:** Sharply rounded or oblique and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low and indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Lies mainly on rostrum, flares dorsally, notch deepens with growth. **Cauda:** Approximately straight, flares and flexes slightly at posterior end, and deepens to undercut the ventral area in larger otoliths (c. 6 mm OD), not distinctly closed. **Ostio-caudal differentiation:** Slight dorso-ventral constrictions. **Ostium/cauda:** 1:1.4, 1:1, 1:1. **Collum:** Absent, slight step to cauda. **Crista superior:** Well developed above ostium and flexion, ridge-like along cauda to flexion, absent at tip. **Crista inferior:** Well developed below ostium and cauda, absent at tip. **Dorsal depression:**



Oval and shallow. **Ventral depression:** Absent, may be irregular groove present in mid-area in large otoliths. **Rostrum:** Large becoming very elongate and pointed. **Antirostrum:** Minute becoming larger with growth, and pointed. **Excisura:** Moderate to wide, notch deepens with growth, angle acute.

#### *Naucrates ductor*, SSF No. 210.35 PLATE 73

**DISTRIBUTION:** Common throughout Indian Ocean; a circumtropical species. Attains 70 cm, common to 38 cm FL.

**MATERIAL:** 1/1 (1.7 mm OD, 258 mm TL), PEM 14838 (RUSI 37085); ORI; Id. PCH.

**Otolith shape:** Hour-glass or anvil. **Thickness:** Moderate. **Form:** - Mesial flat, - Lateral flat. **Dorsal margin:** Approximately flat; sculpture, approximately entire. **Ventral margin:** Approximately flat and slightly irregular. **Posterior margin:** Deeply notched and slightly irregular. **Sulcus acusticus:** Ostio-caudal, heterosulcoid. **Colliculum:** Heteromorph, extremely indistinct colliculi, margins may be visible. **Pseudocolliculum:** Absent. **Ostium:** Very reduced, lies mainly on rostrum. **Cauda:** Ventrally flexed on the pseudo-rostrum. **Ostio-caudal differentiation:** Slightly dorsally constricted. **Ostium/cauda:** 1:1.5. **Collum:** Absent. **Crista superior:** Well developed along entire sulcus. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Absent, dorsal area flattened and reduced. **Ventral depression:** Absent, area reduced. **Rostrum:** Large and pointed, **pseudo-rostrum:** Large and sharply rounded. **Antirostrum:** Large and sharply rounded, **pseudo-antirostrum:** Large and sharply rounded. **Excisura:** Wide, notch deep, angle wide.

#### *Parastromateus niger*, SSF No. 210.36 PLATE 73

**DISTRIBUTION:** At times abundant in Delagoa Bay, eastward to southern Japan and Australia. Attains 55 cm.

**MATERIAL:** 1/1 (3.75 mm OD, 100 mm TL), PEM 0455; Durban; Id. MMS.

**Otolith shape:** Rounded-ovate. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral concave. **Dorsal margin:** Well rounded; sculpture, crenate to irregular. **Ventral margin:** Rounded and crenate. **Posterior margin:** Sharply rounded and crenate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, extremely low, indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Lies mainly on rostrum, flared dorsally. **Cauda:** Approximately straight with slight flex at tip where it narrows slightly. **Ostio-caudal differentiation:** Dorsally constricted. **Ostium/cauda:** 1:1.2. **Collum:** Absent, slight step to cauda. **Crista superior:** Well developed above ostium and cauda, poorly developed at tip. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Absent. **Ventral depression:** Absent, shallow flexed groove under flexion. **Rostrum:** Large, broad and pointed. **Antirostrum:** Small and sharply rounded. **Excisura:** Moderate, notch shallow, angle acute.

#### *Pseudocaranx dentex*, SSF No. 210.37 PLATE 73

**DISTRIBUTION:** Durban southward; an anti-tropical species occurring on both sides of the Atlantic, Mediterranean and Indo-West Pacific eastward to Hawaiian Ids. Attains 96 cm.

**MATERIAL:** 4/6 (4.8-8.4 mm OD, 277-555 mm TL), PEM 10442, 13072, 15476 (RUSI 40620), 9281; Algoa Bay and vicinity; Id. MJS, PCH.

**Otolith shape:** Fusiform. **Thickness:** Moderate. **Form:** - Mesial convex or approximately flat, - Lateral concave or flat. **Dorsal margin:** Raised and rounded; sculpture, lobed and irregular. **Posterior lobe** appears characteristic of species. **Ventral margin:** Slightly rounded and irregular to crenate posteriorly. **Posterior margin:** Blunt or sharply rounded, lobed and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Homomorph, posterior colliculum visible from neck to flexion. **Pseudocolliculum:**

Absent. **Ostium:** Narrow, elongate, lies mainly on rostrum. **Cauda:** Approximately straight, deep, flexed and flared at tip, undercuts ventral area. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.5, 1:1.2, 1:1.2, 1:1.2. **Collum:** Absent, slight step to cauda. **Crista superior:** Ridge-like from ostium along cauda, well developed at tip. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** May be a very shallow depression, dorsal area flattened, area at margin irregular. **Ventral depression:** Absent. **Rostrum:** Large, elongate, spear-like and pointed. **Antirostrum:** Small and pointed or blunt. **Excisura:** Wide, notch shallow, angle acute.

#### *Scomberoides commersonnianus*, SSF No. 210.38 PLATE 73

**DISTRIBUTION:** Widespread throughout Indian Ocean from Algoa Bay northward; also Taiwan to Australia. Reported to attain 120 cm FL.

**MATERIAL:** 1/1 (10.24 mm OD, TL not measured), PEM 2696; northern Natal; Id. GRA.

**Otolith shape:** Fusiform and elongate. **Thickness:** Moderately thin. **Form:** - Mesial approximately flat, - Lateral flat. **Dorsal margin:** Slightly rounded; sculpture, irregular. **Ventral margin:** Slightly sinuous and serrate to irregular. **Posterior margin:** Bilobed, pointed and irregular. **Sulcus acusticus:** Ostial, but cauda not distinctly closed, heterosulcoid. **Colliculum:** Homomorph, only posterior colliculum visible in neck. **Pseudocolliculum:** Absent. **Ostium:** Lies mainly on rostrum and flares ventrally, poorly defined. **Cauda:** Approximately straight, slightly flexed ventrally and somewhat flared at tip, deep, undercuts ventral area after flexion. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1. **Collum:** Absent. **Crista superior:** Well developed along length of sulcus, but poorly developed at tip. **Crista inferior:** Very poorly developed under ostium, well developed under cauda, absent at tip. **Dorsal depression:** Absent, area rough. **Ventral depression:** Absent, groove from neck of sulcus to mid-cauda in mid-area. **Rostrum:** Very large, elongate and pointed. **Antirostrum:** Small and sharply rounded. **Excisura:** Wide, notch moderate, angle acute.

#### *Scomberoides lysan*, SSF No. 210.39 PLATE 73

**DISTRIBUTION:** Widespread in tropical Indo-West Pacific from Durban northward and eastward to Hawaiian Ids. Attains 70 cm FL.

**MATERIAL:** 2/2 (6.56, 6.68 mm OD, 370, 375 mm TL), PEM 0201, 0698; Swartkops, Algoa Bay; Id. MMS.

**Otolith shape:** Elongate and fusiform. **Thickness:** Moderately thin. **Form:** - Mesial flat to slightly convex, - Lateral flat to slightly concave. **Dorsal margin:** Rounded and raised in centre; sculpture, crenate and lobed. **Ventral margin:** Approximately flat and crenate. **Posterior margin:** Sharply rounded, crenate or lobed. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, very low, indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Narrow, lies mainly on rostrum, dorsal margin of rostrum may be raised. **Cauda:** Approximately straight then flexed and flared. Anterior cauda shallow, deepening posteriorly, undercuts ventral area at flexion. **Ostio-caudal differentiation:** Very slight ventral constriction. **Ostium/cauda:** 1:1.2, 1:1.3. **Collum:** Absent. **Crista superior:** Well developed from ostium along cauda, poorly developed after flexion, absent at tip. **Crista inferior:** Well developed along the length of sulcus, absent at tip. **Dorsal depression:** Absent, area slightly flattened. **Ventral depression:** Absent. **Rostrum:** Large, elongate and pointed. **Antirostrum:** Moderate and sharply rounded. **Excisura:** Wide, notch shallow, angle acute.



*Scomberoides tol*, SSF No. 210.40 PLATE 73

**DISTRIBUTION:** Widespread throughout Indian Ocean from Natal northward; also Japan to Australia and eastward to Fiji Ids. Attains 60 cm FL.

**MATERIAL:** 4/8 (2.15-4.6 mm OD, 95-276 mm SL), PEM 2070, 2074, 0422, 1681; Durban; Id. RvdE.

**Otolith shape:** Oblong to fusiform (c. 2 mm OD), becoming elongate fusiform (c. 4 mm OD). **Thickness:** Moderately thin. **Form:** - Mesial flat or slightly convex, - Lateral flat or slightly concave. **Dorsal margin:** Slightly rounded or flat; **sculpture,** irregular. **Ventral margin:** Approximately flat and irregular. **Posterior margin:** Sharply rounded may be indented or bi-lobed and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, very low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Elongate, lies mainly on rostrum, flares dorsally. **Cauda:** Approximately straight, flexes near tip, juveniles more flexed. Anterior cauda shallow, deepening posteriorly. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:1.8, 1:1.7, 1:1.3, 1:1. Collum: Absent. **Crista superior:** Well developed approaching ridge-like, poorly developed at tip. **Crista inferior:** Well developed becoming ridge-like in larger otoliths (>3 mm OD) along the length of sulcus. **Dorsal depression:** Absent, area rough. **Ventral depression:** Absent, may be groove-like depression along ventral side of sulcus in large otoliths. **Rostrum:** Large, becomes elongate and pointed. **Antirostrum:** Small and rounded in juveniles, sharply rounded in large otoliths. **Excisura:** Wide, notch shallow, angle acute.

*Selar crumenophthalmus*, SSF No. 210.41 PLATE 73

**DISTRIBUTION:** Durban northward; worldwide in tropical and subtropical waters. Attains 30 cm.

**MATERIAL:** 1/1 (6.3 mm OD, 305 mm TL), PEM 15679; Comoro Ids; Id. PCH.

**Otolith shape:** Oval to oblong. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Slightly rounded and raised posteriorly; **sculpture,** irregular, may be notched. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Roundly oblique and irregular. **Sulcus acusticus:** Ostial, may appear ostio-caudal, heterosulcoid. **Colliculum:** Heteromorph, anterior colliculum oval and distinct, penetrates excisura; posterior indistinct. **Pseudocolliculum:** Absent. **Ostium:** Short and widely flared. **Cauda:** Elongate, slightly angled ventrally, strongly flexed posteriorly, ending very close to ventral margin; margin notch may penetrate tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.8. **Collum:** Absent. **Crista superior:** Narrow, low ridge along entire sulcus. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Elongate and shallow above cauda, separated from depressed margin by ridge. **Ventral depression:** Absent, shallow groove in lower ventral area. **Rostrum:** Short, broad and pointed. **Antirostrum:** Small and sharply rounded. **Excisura:** Moderately wide, notch shallow, angle acute.

*Seriola lalandi*, SSF No. 210.44 PLATE 74

**DISTRIBUTION:** Most common in Cape waters but migrates to Transkei and Natal in winter; a circumglobal species restricted to subtropical waters. Attains 193 cm, common to 100 cm FL.

**MATERIAL:** 4/33 (5.78-9.3 mm OD, 493-1245 mm FL), PEM 1091, 1339, 5856, 7731; Algoa Bay and vicinity; Id. MJS.

**Otolith shape:** Fusiform becoming elongate with growth. **Thickness:** Moderate. **Form:** - Mesial flat or very slightly convex, - Lateral flat or very slightly concave. **Dorsal margin:** Oblique, raised posteriorly; **sculpture,** may be sinuate or lobed and irregular. **Ventral margin:** Approximately flat and notched and slightly crenate to irregular. **Posterior margin:** Rounded, notched, edge

becomes reduced with growth, sculpture irregular. **Sulcus acusticus:** Ostial (<c. 7 mm OD), may become ostio-caudal (c. 7 mm OD) in larger otoliths with erosion of posterior wall; heterosulcoid. **Colliculum:** Heteromorph, extremely low and indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Very narrow lying along rostrum, deep and floor slightly irregular. **Cauda:** Approximately straight, slightly flexed ventrally in small otoliths, flexion may be eroded in large specimens. Deep posteriorly. **Ostio-caudal differentiation:** Very slight dorso-ventral constrictions. **Ostium/cauda:** 1:1.8, 1:1.2, 5856, 7731 damaged. **Collum:** Absent. **Crista superior:** Well developed to ridge-like over ostium and cauda, may be absent at tip. **Crista inferior:** Poorly developed under ostium in small otoliths (c. 5 mm OD), well developed to ridge-like along sulcus in large otoliths. **Dorsal depression:** Elongate above cauda. **Ventral depression:** Wide, becoming groove-like from tip of cauda to neck. **Rostrum:** Large, elongate and pointed. **Antirostrum:** Small and pointed. **Excisura:** Wide, notch shallow, angle acute.

*Seriola rivoliana*, SSF No. 210.45 PLATE 74

**DISTRIBUTION:** Knysna northward; a circumtropical species entering temperate waters in some areas. Attains 110 cm FL.

**MATERIAL:** 5/8 (5.6-9.12 mm OD, 430-742 mm TL), PEM 0493, 1337 (RUSI 8372), 9279, 15620, 2922; Sodwana Bay, Comoro Ids, Algoa Bay; Id. MJS, PCH.

**Otolith shape:** Fusiform becoming elongate. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Slightly rounded; **sculpture,** crenate or slightly irregular. **Ventral margin:** Approximately flat and irregular. **Posterior margin:** Rounded and crenate or dentate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, very low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Very reduced and narrow, lying along rostrum. **Cauda:** Approximately straight, flexed slightly and flared at tip, deepens posteriorly and undercuts ventral area. **Ostio-caudal differentiation:** Slight dorsal constriction. **Ostium/cauda:** 1:1.3, 1:1.3, 1:1.6, 1:1.2, 1:1.1. **Collum:** Absent, slight step to cauda. **Crista superior:** Ridge-like from ostium along cauda, well developed at tip. **Crista inferior:** Well developed, may be low ridge along sulcus length. **Dorsal depression:** Elongate, shallow and flat along most of dorsal area. **Ventral depression:** Elongate along most of ventral area under crista. **Rostrum:** Large, becoming very elongate and pointed. **Antirostrum:** Small and pointed with dorsal flexion. **Excisura:** Wide, notch shallow, angle acute.

*Seriolina nigrofasciata*, SSF No. 210.46 PLATE 74

**DISTRIBUTION:** Algoa Bay northward and throughout Indian Ocean eastward to Japan and Australia. Attains 70 cm FL.

**MATERIAL:** 3/5 (4.1-4.8 mm OD, 301-374 mm TL), PEM 6387, 1002 (RUSI 7874), 11720; Algoa Bay; Id. MJS, PCH.

**Otolith shape:** Ovate to fusiform. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Raised and rounded; **sculpture,** crenate or irregular. **Ventral margin:** Approximately flat and crenate to irregular. **Posterior margin:** Sharply rounded and crenate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, extremely low and indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Narrow, lies mainly along rostrum. **Cauda:** Straight, not flexed ventrally, narrowing and deepening posteriorly, flaring dorsally. **Ostio-caudal differentiation:** Very slight dorso-ventral constriction. **Ostium/cauda:** 1:1.2, 1:1.3, 1:1.7. **Collum:** Absent. **Crista superior:** Well developed. **Crista inferior:** Well developed to ridge-like in large otoliths. **Dorsal depression:** Shallow above neck. **Ventral depression:** Elongate beneath ventral crista in large otoliths. **Rostrum:** Moderate, broad and pointed. **Antirostrum:**



Small, broad and blunt. **Excisura:** Wide, notch shallow, angle wide.

#### *Trachinotus africanus*, SSF No. 210.47 PLATE 74

**DISTRIBUTION:** Occurs from Knysna northward to Delagoa Bay; from Gulfs of Aden and Oman, and eastern Indian Ocean on western side of Indonesian Archipelago. Attains at least 90 cm FL.

**MATERIAL:** 5/27 (2.8-13.0 mm OD, 126-905 mm TL), PEM 6636, 1568 (RUSI 8373), 7817, 8805, 9640; Natal and Algoa Bay; Id. MJS, PCH.

**Otolith shape:** Rounded-ovate. **Thickness:** Moderate. **Form:** - **Mesial** approximately flat, - **Lateral** slightly concave. **Dorsal margin:** Flat or slightly rounded; **sculpture**, slightly irregular. **Ventral margin:** Approximately flat, crenate, serrate or slightly irregular. **Posterior margin:** Sharply rounded or blunt, may be bi-lobed and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Wide, lying along rostrum, dorsal rostral edge may become raised. **Cauda:** Wide, approximately straight, slightly flexed and deepening posteriorly. **Ostio-caudal differentiation:** Dorsally constricted. **Ostium/cauda:** 1:1.1, 1:1.6, 1:1.3, 1:1.4, 1:1.6. **Collum:** Absent. **Crista superior:** Well developed or ridge-like over ostium, well developed above cauda. **Crista inferior:** Poorly developed under ostium, ridge-like under cauda. **Dorsal depression:** Absent, area uneven. **Ventral depression:** Absent, may be a deep groove from tip of cauda forward to neck, absent in small otoliths (<c. 5 mm OD). **Rostrum:** Large, broad and rounded. **Antirostrum:** Small and pointed. **Excisura:** Moderate, notch shallow, angle acute.

#### *Trachinotus botla*, SSF No. 210.50 PLATE 74

**DISTRIBUTION:** From Algoa Bay northward to Kenya; also Madagascar, Sri Lanka and western Australia. Attains 75 cm FL.

**MATERIAL:** 4/16 (4.0-8.2 mm OD, 212-495 mm TL), PEM 8585, 7444, 7449, 7445; Banga Nek and Durban; Id. MMS, MJS.

**Otolith shape:** Fusiform. **Thickness:** Moderately thin. **Form:** - **Mesial** flat, - **Lateral** flat. **Dorsal margin:** Slightly rounded and notched; **sculpture**, crenate or irregular. **Ventral margin:** Flat and crenate or irregular. **Posterior margin:** Sharply rounded and crenate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, very low, indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Narrow, lies along rostrum, poorly defined. **Cauda:** Approximately straight to sinuous, deeper at posterior. Anterior cauda poorly defined. **Ostio-caudal differentiation:** Dorsally constricted. **Ostium/cauda:** 1:1.9, 1:1.2, 1:1.3, 1:1.3. **Collum:** Absent. **Crista superior:** Well developed along sulcus. **Crista inferior:** Very poorly developed under ostium, poorly developed under cauda, well developed under tip. **Dorsal depression:** Absent, area uneven. **Ventral depression:** Absent, area uneven. **Rostrum:** Large, broad, may be arrow-shaped and tip pointed. **Antirostrum:** Small, hooked and pointed. **Excisura:** Wide, notch moderate, angle acute.

#### *Trachurus delagoa*, SSF No. 210.51 PLATE 75

**DISTRIBUTION:** Eastern Cape northward to Mozambique; also southern Madagascar and Walters Shoals. Attains 35 cm FL.

**MATERIAL:** 4/21 (1.7-6.1 mm OD, 52-184 mm TL), PEM 2541, 3640, 6721 (RUSI 28372), 6710, [6719 (RUSI 28372), 15490, 15491 (both RUSI 40550)]; Natal and southeastern Cape; Id. MJS, PCH.

**Otolith shape:** Approximately oval becoming more elongate oval with growth (c. 6 mm OD). **Thickness:** Moderate. **Form:** - **Mesial** slightly convex, - **Lateral** concave. **Dorsal margin:** Rounded; **sculpture**, crenate. **Ventral margin:** Rounded and crenate or slightly irregular. **Posterior margin:** Sharply rounded and crenate or irregular. **Sulcus acusticus:** Ostial, may become

ostio-caudal, heterosulcoid. **Colliculum:** Heteromorph, low, indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Short and oval. **Cauda:** Straight and narrow, strongly flexed and deepening at tip, ending close to margin where it may have a narrow canal to margin in large otoliths. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.8, 1:1.5, 1:1.7, 1:2. **Collum:** Absent, step to cauda. **Crista superior:** Well developed above ostium, ridge-like along cauda, well developed after flexion. **Crista inferior:** Ridge-like below sulcus in small otoliths, well developed in large otoliths. **Dorsal depression:** Shallow, above cauda. **Ventral depression:** Absent, may be a groove from neck of sulcus to tip near margin. **Rostrum:** Large, broad and sharply rounded. **Antirostrum:** Minute or small and rounded. **Excisura:** Moderate to moderately wide, notch very shallow, angle wide.

#### *Trachurus trachurus*, SSF No. 210.52 PLATE 75

**DISTRIBUTION:** Delagoa Bay southward and around the Cape, northward to Norway. Attains 70 cm.

**MATERIAL:** 6/235 (2.8-11.05 mm OD, 86-418 mm TL), PEM 7321 (RUSI 28505), 14438 (RUSI 28373), 14440 (RUSI 28373), 14441, 12408, 10542; Cape south and west coasts; Id. MJS, PCH.

**Otolith shape:** Oval (<4 mm OD) becoming approximately fusiform. **Thickness:** Moderate. **Form:** - **Mesial** flat or slightly convex, - **Lateral** flat or slightly concave. **Dorsal margin:** Slightly rounded; **sculpture**, crenate to lobed. **Ventral margin:** Rounded and crenate to slightly irregular; slightly rounded in large otoliths (c. 6 mm OD). **Posterior margin:** Sharply rounded and lobed. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, very lobed colliculi. **Pseudo-colliculum:** Absent. **Ostium:** Approximately oval, becoming elongate and lying along rostrum in large otoliths. **Cauda:** Straight and narrow for most of its length with flexion at tip, does not reach margin. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:2.1, 1:1.8, 1:1.9, 1:1.4, 1:1.5, 1:2. **Collum:** Absent, low step in small otoliths. **Crista superior:** Ridge-like above ostium and cauda, well developed after flexion. **Crista inferior:** Well developed. **Dorsal depression:** Very shallow and elongate above crista. **Ventral depression:** Absent. **Rostrum:** Short and broad becoming elongate and pointed with growth. **Anti-rostrum:** Absent or small and pointed. **Excisura:** Moderate, notch shallow, angle wide.

#### CORYPHAENIDAE Nelson No. 308

**Family characteristics:** Based on a single species, otoliths very small (<c. 3 mm), delicate and ovate. Rostrum and antirostrum angled and pointed or sharply rounded. Sulcus heterosulcoid with ostio-caudal opening.

#### *Coryphaena hippurus*, SSF 211.2 PLATE 75

**DISTRIBUTION:** All tropical and subtropical waters to 35°S. Attains 2m, 39.9 kg.

**MATERIAL:** 1/1 (2.2 mm OD, 981 mm TL), PEM 15372; Cape south coast; Id. MJS, lodged in JLSII.

**Otolith shape:** Ovate. **Thickness:** Thin and delicate. **Form:** - **Mesial** Concave, - **Lateral** convex. **Dorsal margin:** Slightly rounded and notched; **sculpture**, slightly irregular. **Ventral margin:** Approximately flat and slightly irregular. **Posterior margin:** Approximately flat, notched and slightly irregular. **Sulcus acusticus:** Ostio-caudal, heterosulcoid. **Colliculum:** Heteromorph, very indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Flared widely dorsally and ventrally. **Cauda:** Approximately straight, slightly flared and dorsal margin slightly flexed. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:0.7. **Collum:** Absent. **Crista superior:** Poorly developed above anterior ostium, high ridge above mid-ostium to flexion, well developed to caudal tip, absent at tip. **Crista inferior:**



Poorly developed below anterior ostium, ridge-like from neck to caudal tip. **Dorsal depression:** Deep, entire area depressed. **Ventral depression:** Deepest near crista, area angled towards sulcus. **Rostrum:** Large and broad, angled to sharply rounded tip. **Antirostrum:** Moderately large, angled and pointed. **Excisura:** Very wide, notch deep, angle acute.

**LEIOGNATHIDAE Nelson No. 311**

**Family characteristics:** Otoliths discoid initially becoming oval-ovate or rectangular-ovate, up to c. 8 mm OD. Heterosulcoid with ostial openings, but one species may appear ostio-caudal when large (c. 8 mm OD). Heteromorph, low and indistinct colliculi. Ostium deep and V-shaped, cauda flared but not strongly flexed, deeper at tip. Ridge-like or well developed crista superior with distinct dorsal depression.

**Key**

- 1a. Otolith rectangular-ovate; otolith with flattened dorsal margin; rostrum broad, blunt and flared anteriorly . . . . . *Leiognathus equula* 201.3
- 1b. Otolith ovate or discoid (juveniles); otolith with rounded or slightly rounded dorsal margin; rostrum narrows anteriorly . . . . . 2
- 2a. Rostrum with angled ventral margin, narrow; antirostrum generally broad; dorsal depression narrow and deep . . . . . *Secutor insidiator* 201.4
- 2b. Rostrum broad and rounded; antirostrum generally small and narrow; dorsal depression elongate over most of dorsal area . . . . . *Gazza minuta* 201.1

***Gazza minuta*, SSF No. 201.1 PLATE 75**

**DISTRIBUTION:** Indo-Pacific (excluding Hawaii); south to Port Alfred. Attains 18 cm.

**MATERIAL:** 5/15 (1.4-7.9 mm OD, 47-161 mm TL), PEM 9359, 9354, 15264 (RUSI 36875), 6645, 6753 (RUSI 28375); Tugela Bank to Durban, Natal; Id. MJS, PCH.

**Otolith shape:** Ovate. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral approximately flat. **Dorsal margin:** Rounded becoming slightly rounded; **sculpture**, irregular, juvs crenate (<c. 3 mm OD). **Ventral margin:** Rounded to slightly rounded and crenate to irregular. **Posterior margin:** Rounded to blunt and irregular. **Sulcus acusticus:** Ostial. May have groove from margin making it appear ostio-caudal, heterosulcoid. **Colliculum:** Heteromorph, low anterior colliculum, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Deep, oval in shape and ends in a V. **Cauda:** Ventral margin is straight, dorsal margin flares slightly and deepens at tip. **Ostio-caudal differentiation:** Slight dorso-ventral constrictions. **Ostium/cauda:** 1:1, 1:0.9, 1:1.3, 1:1, 1:1.2. **Collum:** Absent, slight step to cauda. **Crista superior:** Well developed at extremes, ridge-like elsewhere. **Crista inferior:** Well developed the length of the sulcus. **Dorsal depression:** Oval and deep. **Ventral depression:** Absent, groove midway down ventral area from tip of cauda to mid-ostium, deep in large otoliths. **Rostrum:** Large, broad and sharply rounded becoming pointed (c. 7 mm OD). **Antirostrum:** Moderate and rounded. **Excisura:** Moderate, notch moderately deep, angle acute.

***Leiognathus equula*, SSF No. 201.3 PLATE 75**

**DISTRIBUTION:** Indo-Pacific, common in Natal, reaches East London. Attains 25 cm.

**MATERIAL:** 5/17 (3.6-6.3 mm OD, 110-223 mm TL), PEM 6749 (RUSI 28376), 6745 (RUSI 28376), 15284 (RUSI 36870), 14525 (RUSI 31459), 14529, [15285 (RUSI 36870)]; Mauritius, Tugela Bank and Natal; Id. MJS, MEA.

**Otolith shape:** Approximately rectangular to ovate. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Raised anteriorly, flattened and angled posteriorly; **sculpture**, irregular, crenate or dentate. **Ventral margin:** Approximately flat and dentate or serrate. **Posterior margin:** Oblique, flat or blunt and crenate or irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low anterior, very low posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Flared, ends in a V-shape, deeper than cauda. **Cauda:** Ventral margin straight, slightly flared dorsally, deeper posteriorly. **Ostio-caudal differentiation:** Slight dorso-ventral constrictions. **Ostium/cauda:** 1:1.1, 1:1, 1:1.1, 1:1.1, 1:1.4. **Collum:** Absent, slight step to cauda. **Crista superior:** Well developed over ostium, ridge-like over cauda, poorly developed at caudal tip. **Crista inferior:** Well developed. **Dorsal depression:** Oval and deep. **Ventral depression:** Absent, ventral area may be depressed near margin. **Rostrum:** Broad, blunt and rounded. **Antirostrum:** Small or minute, and sharply rounded. **Excisura:** Moderate, notch shallow, angle acute.

***Secutor insidiator*, SSF No. 201.4 PLATE 76**

**DISTRIBUTION:** Indo-West Pacific except Australia; south to East London. Attains 10 cm.

**MATERIAL:** 4/20 (1.1-4.1 mm OD, 32-125 mm TL), PEM 9363, 2080, 15267 (RUSI 36872), 6750 (RUSI 28374), [15266 (RUSI 36872)]; Tugela Bank and Natal; Id. MJS, PCH.

**Otolith shape:** Approximately discoid as juveniles (<2 mm OD), becoming ovate. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Slightly rounded to flat; **sculpture**, irregular. **Ventral margin:** Slightly rounded or flat and serrate or irregular. **Posterior margin:** Rounded in small, flattened or oblique in large otoliths (>c. 2 mm OD), irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, irregular, low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Flared slightly, V-shaped and deep. **Cauda:** Ventral margin straight, slightly flared and flexed dorsally, deeper posteriorly. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.3, 1:1.1, 1:0.8, 1:1. **Collum:** Absent, step to cauda. **Crista superior:** Ridge-like from ostium to near tip of cauda, tip poorly developed. **Crista inferior:** Well developed under ostium, ridge-like under cauda. **Dorsal depression:** Oval and deep. **Ventral depression:** Absent, may be one or two grooves in mid-ventral area. **Rostrum:** Large and sharply rounded. **Antirostrum:** Large, broad and sharply rounded. **Excisura:** Moderate, notch moderately deep, angle acute becoming wide.

**BRAMIDAE Nelson No. 312**

**Family characteristics:** Only two species available. Otoliths ovate to fusiform, up to c. 7 mm OD. Heterosulcoid, ostial opening. Ostium narrow and reduced, cauda flares at tip, not ventrally flexed. Heteromorph. Dorsal and ventral cristae ridge-like, dorsal depression narrow and deep.

**Key**

- 1a. Dorsal margin of otolith flattened; posterior margin angularly oblique; dorsal depression distinct and elongate; rostrum without dorsal hook at tip . . . . . *Brama brama* 207.1
- 1b. Dorsal margin of otolith slightly rounded; posterior margin bluntly rounded; dorsal depression short and moderately deep; rostrum may have dorsal hook at tip . . . . . *Brama orcinus* 207.2



### *Brama brama*, SSF No. 207.1 PLATE 76

**DISTRIBUTION:** Between Algoa Bay and Walvis Bay. Plentiful in north Atlantic, known from Australia, New Zealand, Chile. Attains at least 70 cm.

**MATERIAL:** 4/45 (3.5-6.2 mm OD, 351-555 mm TL), PEM 13874, 13628, 13869, 13178; Cape west coast; Id. MJS.

**Otolith shape:** Ovate to fusiform. **Thickness:** Moderate. **Form:** - **Mesial** convex, - **Lateral** concave. **Dorsal margin:** Slightly rounded or flattened; **sculpture**, crenate. **Ventral margin:** Slightly rounded or flattened and crenate to irregular. **Posterior margin:** Oblique, blunt and crenate to slightly irregular. **Sulcus acusticus:** Ostial, may have slight groove from margin, heterosulcoid. **Colliculum:** Heteromorph, indistinct colliculi depressed in centre. **Pseudocolliculum:** Absent. **Ostium:** Narrow, lies mainly on rostrum, same depth as cauda. **Cauda:** Widens and deepens posteriorly with steep walls. **Ostio-caudal differentiation:** Slight dorso-ventral constrictions. **Ostium/cauda:** 1:0.9, 1:0.8, 1:0.5, 1:0.9. **Collum:** Absent. **Crista superior:** Ridge-like along sulcus, well developed at tip. **Crista inferior:** Well developed to ridge-like under ostium, ridge-like under cauda. **Dorsal depression:** Very deep and oval-shaped. **Ventral depression:** Elongate below crista inferior, deepest in large otoliths. **Rostrum:** Large, elongate and sharply rounded. **Antirostrum:** Large, broad and sharply rounded. **Excisura:** Wide, notch moderate, angle acute.

### *Brama orcini*, SSF No. 207.2 PLATE 76

**DISTRIBUTION:** Off Natal; tropical Indo-Pacific. Attains 35 cm. **MATERIAL:** 4/12 (2.3-3.4 mm OD, 128-262 mm TL), PEM 5164, 5161, 5165, 7915 (RUSI 20115); Cape west coast and off Algoa Bay; Id. MJS, PCH, MEA.

**Otolith shape:** Approximately ovate. **Thickness:** Moderately thin. **Form:** - **Mesial** convex, - **Lateral** concave. **Dorsal margin:** Slightly rounded; **sculpture**, crenate. **Ventral margin:** Approximately flat and crenate. **Posterior margin:** Bluntly rounded and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, very low anterior, indistinct, indented posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Narrow, shallow, lies mainly along rostrum, ends in a V. **Cauda:** Shallow, ventral edge approximately straight, tip flared and poorly defined. **Ostio-caudal differentiation:** Slight dorso-ventral constrictions. **Ostium/cauda:** 1:1, 1:0.9, 1:1, 1:1.2. **Collum:** Absent. **Crista superior:** Ridge-like, moderately poorly developed at posterior tip. **Crista inferior:** Poorly developed under anterior ostium, ridge-like elsewhere. **Dorsal depression:** Oval and elongate. **Ventral depression:** Shallow, elongate under crista. **Rostrum:** Large, elongate and pointed, may have dorsal hook at tip. **Antirostrum:** Small and sharply rounded or pointed. **Excisura:** Wide, notch shallow, angle wide.

### EMMELICHTHYIDAE Nelson No. 315

**Family characteristics:** Only two species available. Otoliths approximately ovate, up to c. 11 mm OD. Heterosulcoid with ostial opening. Ostium flared dorsally, cauda straight along most of its length. Crista superior ridge-like to flexion, otherwise crista well developed. Heteromorph, with low, indistinct colliculi.

#### Key

- 1a. Excisural notch moderate; rostrum elongate; caudal tip deep and flared, indistinctly closed near ventral margin . . . . *Emmelichthys n. nitidus* 209.1
- 1b. Excisural notch very shallow; rostrum short and broad; caudal tip distinctly flexed, closed well short of ventral margin . . . . . *Plagiogeneion rubiginosus* 209.3

### *Emmelichthys nitidus nitidus*, SSF No. 209.1 PLATE 76

**DISTRIBUTION:** Occasionally taken off western Cape coast. Also occurs off Australia, New Zealand, St Paul and Amsterdam Ids. Attains 50 cm.

**MATERIAL:** 5/60 (3.1-9.6 mm OD, 82-320 mm SL), PEM 14720, 13894, 12123, 12227, 9736; west and Cape south coasts; Id. MJS, PCH.

**Otolith shape:** Approximately ovate. **Thickness:** Moderate. **Form:** - **Mesial** slightly convex, - **Lateral** slightly concave. **Dorsal margin:** Flattened or slightly rounded; **sculpture**, crenate to slightly irregular. **Ventral margin:** Slightly rounded, crenate in small otoliths, becoming more dentate with growth (>c. 8 mm OD). **Posterior margin:** Sharply rounded, may be notched, crenate in juveniles, irregular in large otoliths (c. 9 mm OD). **Sulcus acusticus:** Ostial, may be penetrated by notch from margin at caudal tip, may appear ostio-caudal, heterosulcoid. **Colliculum:** Heteromorph, low anterior, indistinct posterior colliculum indented in centre. **Pseudocolliculum:** Absent. **Ostium:** Lies mainly on rostrum, deep. **Cauda:** Straight and narrow, flexes and deepens posteriorly. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.1, 1:0.9, 1:1.1, 1:1, 1:1.1. **Collum:** Absent, step up to cauda in large otoliths. **Crista superior:** Ridge-like from ostium to flexion, well developed from flexion. **Crista inferior:** Ridge-like from ostium along cauda, poorly developed at tip. **Dorsal depression:** Large, broad and shallow, most of dorsal area depressed. **Ventral depression:** Absent, may be shallow grooves near margin of otolith from ostium to caudal tip. **Rostrum:** Large, elongate and pointed or sharply rounded. **Antirostrum:** Small and pointed or sharply rounded. **Excisura:** Wide, notch shallow, angle acute.

### *Plagiogeneion rubiginosus*, SSF No. 209.3 PLATE 76

**DISTRIBUTION:** Common off Algoa Bay, also known from New Zealand, Australia, Sri Lanka, St Paul and Amsterdam Ids and Vema Seamount, west of Cape Town. Attains 60 cm.

**MATERIAL:** 6/42 (3.9-11 mm OD, 116-365 mm TL), PEM 14292, 14201 (RUSI 28377), 14437 (RUSI 28377), 14359, 11696, 11695, [15025 (RUSI 35597)]; Cape south coast; Id. MJS, PCH.

**Otolith shape:** Approximately oval becoming rounded-ovate. **Thickness:** Moderate. **Form:** - **Mesial** convex, - **Lateral** concave. **Dorsal margin:** Slightly rounded; **sculpture**, crenate. **Ventral margin:** Slightly rounded and crenate or slightly irregular. **Posterior margin:** Rounded and crenate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, colliculi very low, indistinct. **Pseudocolliculum:** Absent. **Ostium:** Wide, flared dorsally, dorsal edge may be irregular. **Cauda:** Long, narrow and straight, flexed near tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.3, 1:1.2, 1:1.3, 1:1.6, 1:1.8, 1:1.9. **Collum:** Absent, slight step to cauda. **Crista superior:** Well developed above ostium and after caudal flexion, ridge-like above anterior cauda. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Approximately oval. **Ventral depression:** Absent, may be shallow, wide groove from caudal tip to ostium. **Rostrum:** Moderate, broad and pointed. **Antirostrum:** Absent or small and rounded. **Excisura:** Moderate, notch shallow, angle wide.

### LUTJANIDAE Nelson No. 316

**Family characteristics:** Otoliths oval-ovate to fusiform or approximately rhomboidal (at least juvs); up to c. 23 mm OD. Ostium approximately oval to oblong; cauda usually flexed near tip, may be gently flexed along the length; rarely, almost straight. Heterosulcoid with ostial openings although in some species the cauda not distinctly closed and may open into ventral depression. Colliculi heteromorph with low but usually distinct anterior colliculum, posterior colliculum indented and indistinct but margins usually

visible. Otolith usually strongly convex, antirostrum often has groove along it, which may join up with dorsal margin groove.

**Key**

- 1a. Otolith approximately obovate to oblong; ostium flares widely dorsally and ventrally; cauda wide, walls rough; ventral margin of otolith may be notched under caudal tip . . . . . *Macolor niger* 181.20
- 1b. Otolith oval-ovate, rounded-ovate, rhomboidal or fusiform; ostium does not flare widely dorsally and ventrally; cauda moderately narrow, walls not rough; cauda without notch under caudal tip . . . . . 2
- 2a. Otolith ovate to fusiform; rostrum elongate, moderate to narrow; dorsal margin of otolith highly irregular, dentate and digitate . . . . . 3
- 2b. Otolith oval-ovate or rhomboidal; rostrum short and broad; dorsal margin of otolith slightly irregular, irregular or crenate . . . . . 6
- 3a. Antirostrum large and moderately broad; cauda flared, flexed and deeper at tip; dorsal margin of otolith well rounded . . . . . *Aprion virescens* 181.3
- 3b. Antirostrum relatively small; cauda narrow; dorsal margin of otolith rounded . . . . . 4
- 4a. Rostrum broad but with tip pointed; ventral depression under caudal tip broad; cauda gently flexed along its length, tip may be open to ventral depression (juveniles with angled ventral margin) . . . . . *Pristipomoides filamentosus* 181.22
- 4b. Rostrum elongate or large, rounded or sharply rounded; ventral margin markedly depressed, may be groove-like under ostium; cauda flexed near tip . . . . . 5
- 5a. Dorsal area raised; cauda gently flexed in posterior third; ostium approximately oval . . *Etelis coruscans* 181.4
- 5b. Dorsal area less raised; cauda gently flexed near tip; ostium elongate oblong . . . . *Aphareus rutilans* 181.2
- 6a. Otolith rhomboidal to oblong; rostrum relatively short . . . . . 7
- 6b. Otolith oval-ovate, rostrum relatively more elongate . . . . . 8
- 7a. Ostium oval; cauda slightly curved; caudal tip indistinct; anterior colliculum not distinctly raised . . . . . *Pristipomoides argyrogrammicus* 181.-
- 7b. Ostium more elongate oval; caudal tip open; anterior colliculum raised and distinct . . . . . *Pristipomoides zonatus* 181.24
- 8a. Otolith oval-ovate, approaching fusiform; ventral depression under caudal tip distinct . . . . . 9
- 8b. Otolith oval to oval-ovate; ventral depression less distinct or absent . . . . . 10
- 9a. Dorsal wall of ostium bulbous; anterior end of ventral depression deep and rounded. . . *Paracaesio sordida* 181.-
- 9b. Dorsal wall of ostium approximately straight; anterior end of ventral depression shallow, elongate . . . . . *Paracaesio xanthura* 181.21
- 10a. Cauda gently flexed along its length . . . . . 11
- 10b. Cauda straight, flexed near tip . . . . . 14
- 11a. Otolith approximately oval . . . . . 12
- 11b. Otolith oval-ovate or oblong-ovate . . . . . 13
- 12a. Dorsal and ventral margins of otolith well rounded; dorsal margin depressed with groove; ventral groove close to ventral margin; ostium flared with anterior lip; cauda gently flexed and moderately deep . . . . . *Lutjanus notatus* 181.15

- 12b. Dorsal margin of otolith rounded but not depressed, ventral margin slightly rounded; ventral groove absent but margin slightly depressed under caudal tip; ostium oval, elongate with groove along antirostrum; cauda short and flexed along its length . . . *Lutjanus rivulatus* 181.16
- 13a. Cauda moderately deep, short, ends far from margin; ostium moderately elongate, flared slightly dorsally; ventral margin depressed under caudal tip, no groove present; no groove on antirostrum . . . . . *Lutjanus sebae* 181.19
- 13b. Cauda moderately deep, ends close to margin; ostium flared dorsally and ventrally; ventral margin not distinctly depressed, ventral groove close to ventral margin present; antirostrum with groove . . . . . *Lutjanus russellii* 181.17
- 13c. Cauda deep tip ends well short of margin; ostium flared dorsally; ventral margin depressed below caudal tip, no groove present; no groove on antirostrum but pit above ostium may be present . . . *Lutjanus sanguineus* 181.18
- 14a. Ventral margin of ostium with distinct crista . . . . . 15
- 14b. Ventral margin of ostium poorly defined . . . . . 16
- 15a. Ostium oblong, narrow and elongate; ventral wall of ostium approximately straight; cauda sharply flexed, tip short; rostrum short, broad and sharply rounded; antirostrum groove present . *Lutjanus fulviflamma* 181.8
- 15b. Ostium oval and moderately elongate, its ventral margin slightly sinuous; cauda deep and sharply flexed becoming less sharply flexed with growth; rostrum large, broad and sharply rounded; antirostrum groove present . . . . *Lutjanus argentimaculatus* 181.5
- 15c. Ostium oval, ventral margin horizontal; cauda straight , sharply flexed in second 1/2; rostrum broad and rounded; antirostrum groove present . . . *Lutjanus fulvus* 181.9
- 15d. Ostium approximately oval, filled with colliculum with steep dorsal wall, ventral margin of ostium slightly sinuous; cauda straight, strongly flexed, tip may be slightly flared; rostrum moderate, broad and sharply rounded; antirostrum groove present . . *Lutjanus lutjanus* 181.13
- 15e. Ostium approximately oval, its ventral wall slightly sinuous; cauda flexed along second 1/2, moderately deep; rostrum short, broad and sharply rounded; antirostrum groove present; ventral area of otolith broad and distinct - . . . . . *Lutjanus kasmira* 181.11
- 16a. Rostrum short, broad and sharply rounded; ostium flared; cauda deep; deep groove on antirostrum; dorsal depression absent . . . . *Lutjanus gibbus* 181.10
- 16b. Rostrum short, broad and blunt; ostium oval and slightly flared dorsally; short, shallow groove on antirostrum; dorsal depression shallow . . . . *Lutjanus bohar* 181.6

***Aphareus rutilans*, SSF No. 181.2 PLATE 77**

**DISTRIBUTION:** Tropical Indo-Pacific; extends south to Durban. Attains 110 cm.

**MATERIAL:** 2/3 (13.6, 17.28 mm OD, 650, 900 mm TL), PEM 15609, 1408H; Comoro Ids, Kosi Bay; Id. PCH, lodged in JLBsII.

**Otolith shape:** Fusiform. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Rounded; sculpture, highly dentate or digitate. **Ventral margin:** Slightly rounded, dentate to digitate and irregular. **Posterior margin:** Pointed and digitate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, slightly raised anterior and indistinct, low posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Oval, narrow and elongate lying mainly on the rostrum. **Cauda:** Steep walls, gently flexed deep tip, not distinctly closed. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.1,



1:0.9. **Collum:** Absent. **Crista superior:** Well developed above ostium, ridge-like above cauda and absent at tip. **Crista inferior:** Moderately well developed along entire sulcus. **Dorsal depression:** Absent, margin may be depressed. **Ventral depression:** Absent, margin depressed, becoming groove-like under ostium. **Rostrum:** Large, elongate and sharply rounded. **Antirostrum:** Moderate and sharply rounded or pointed. **Excisura:** Wide, notch moderately deep, angle varied.

***Aprion virescens*, SSF No. 181.3 PLATE 77**

**DISTRIBUTION:** Tropical Indo-Pacific; occasionally caught off Natal and once found at Knysna. Attains 100 cm.

**MATERIAL:** 6/27 (7.1-9.8 mm OD, 351-816 mm TL), PEM 8406, 8487, 8494, 8480, 1658 (RUSI 8538), 8387; Sodwana, Kosi and Kini Bays; Id. MJS, PCH.

**Otolith shape:** Rounded-ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Lateral surface:** Short lip on ventral margin. **Dorsal margin:** Well rounded; sculpture, dentate or digitate. **Ventral margin:** Slightly rounded and crenate anteriorly becoming serrate and dentate (>8 mm OD). **Posterior margin:** Rounded and dentate or irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low and indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Deep, flared and wide. **Cauda:** Gently flexed with steep ventral wall and slightly flared at tip, tip closer to posterior margin with growth. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.2, 1:1.1, 1:1, 1:1.1, 1:1.1, 1:1. **Collum:** Absent, step up to cauda. **Crista superior:** Well developed over anterior ostium and after flexion, ridge-like above ostium to flexion. **Crista inferior:** Poorly developed below ostium, well developed under cauda. **Dorsal depression:** Oval and shallow above neck. **Ventral depression:** Oval under caudal tip becoming deep with growth. **Rostrum:** Large, broad, moderately elongate and sharply rounded. **Antirostrum:** Large, broad and pointed. **Excisura:** Wide, notch moderate or deep, angle acute.

***Etelis coruscans*, SSF No. 181.4 PLATE 77**

**DISTRIBUTION:** Tropical/subtropical Indo-Pacific, extends south to the Bashee River (32°S). Attains 120 cm.

**MATERIAL:** 5/11 (4.2-16.0 mm OD, 127-875 mm TL), PEM 5067, 14546 (RUSI 31436), 8496, 8478, 8381; Sodwana, Mauritius and Kenya; Id. PCH, MJS.

**Otolith shape:** Oval-ovate (<7.4 mm OD) becoming fusiform. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral concave. **Dorsal margin:** Rounded; sculpture, crenate becoming dentate and digitate. **Ventral margin:** Slightly rounded and crenate becoming serrate or dentate. **Posterior margin:** Rounded and crenate (<7.4 mm OD) becoming pointed and dentate or digitate. **Sulcus acusticus:** Ostial becoming ostio-caudal (>c. 9 mm OD), heterosulcoid. **Colliculum:** Heteromorph with low and indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Elongate and oval with a steep dorsal wall and lying mainly on the rostrum. **Cauda:** Elongate and approximately horizontal with slight flex in posterior third; the deep tip is not closed in large otoliths. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.5, 1:1.9, 1:1, 1:1.2, 1:1.1. **Collum:** Absent. **Crista superior:** Well developed above ostium and after flexion, ridge-like to flexion, may be absent at tip. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Oval and shallow. **Ventral depression:** Absent, margin depressed. **Rostrum:** Large, elongate and sharply rounded. **Antirostrum:** Small or moderate and sharply rounded. **Excisura:** Wide, notch and angle variable.

***Lutjanus argentimaculatus*, SSF No. 181.5 PLATE 77**

**DISTRIBUTION:** Red Sea and tropical Indo-West Pacific region, south to East London. Attains 100 cm.

**MATERIAL:** 5/14 (8.2-15.78 mm OD, 200-636 mm TL, 0462 not measured), PEM 0733, 5916 (RUSI 16103), 7431, 1922 (RUSI 11162), 0462; Natal to southeastern Cape; Id. GJBR, MJS, PCH, RvdE.

**Otolith shape:** Oval to rounded-ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Rounded; sculpture, slightly crenate, dentate or irregular. **Ventral margin:** Slightly rounded and crenate or dentate. **Posterior margin:** Oblique and bluntly rounded, crenate, dentate or irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph with low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Oval, moderately elongate and deep, dorsal rostral margin is uneven. **Cauda:** Straight and sharply flexed in juveniles (<c. 12 mm OD), more gently flexed with growth and tip deep. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:0.9, 1:1, 1:0.9, 1:0.9, 1:0.8. **Collum:** Absent. **Crista superior:** Well developed along entire sulcus, may be ridge-like above anterior cauda. **Crista inferior:** Poorly developed below ostium, well developed below cauda. **Dorsal depression:** Deep and oval above anterior cauda. **Ventral depression:** Absent. **Rostrum:** Large, broad and sharply rounded. **Antirostrum:** Small and pointed becoming more rounded with growth, groove present. **Excisura:** Wide, notch shallow, angle acute.

***Lutjanus bohar*, SSF No. 181.6 PLATE 77**

**DISTRIBUTION:** Red Sea and tropical Indo-West Pacific, south to Durban. Attains 80 cm.

**MATERIAL:** 3/8 (8.1-10.4 mm OD, 345-515 mm TL), PEM 8314 (RUSI 34156), 8375, 8370; Kosi Bay and Ledsman Shoal; Id. MJS, PCH.

**Otolith shape:** Oval to rounded-ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral extremely concave. **Dorsal margin:** Rounded; sculpture, irregular. **Ventral margin:** Slightly rounded and crenate to irregular. **Posterior margin:** Sharply rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, with low anterior, very indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Oval, ventral edge poorly defined. **Cauda:** Straight then sharply flexed, deeper at tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:0.9, 1:1.1, (8314 broken). **Collum:** Absent, step up to cauda. **Crista superior:** Well developed above entire sulcus. **Crista inferior:** Very poorly developed under ostium, well developed under cauda. **Dorsal depression:** Very shallow and oval with short, shallow groove along the antirostrum. **Ventral depression:** Absent, margin depressed under caudal tip. **Rostrum:** Short, broad and blunt. **Antirostrum:** Small and sharply rounded. **Excisura:** Wide, notch shallow, angle wide.

***Lutjanus fulviflamma*, SSF No. 181.8 PLATE 77**

**DISTRIBUTION:** Red Sea and tropical Indo-West Pacific, south to East London. Attains 30 cm.

**MATERIAL:** 2/15 (5.66, 6.24 mm OD, 120, 135 mm TL), PEM 0738, 0739; Durban Bay; Id. RvdE.

**Otolith shape:** Approximately oval. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Rounded; sculpture, crenate or irregular. **Ventral margin:** Rounded and crenate or irregular. **Posterior margin:** Sharply rounded and crenate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, very low anterior and posterior colliculi. **Pseudocolliculum:** Absent. **Ostium:** Oblong, narrow and elongate, ventral wall approximately straight and rostral edge



uneven. **Cauda:** Straight with steep walls, flexed in the posterior third. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.2, 1:1.4. **Collum:** Absent. **Crista superior:** Absent at anterior ostium, well developed over posterior ostium and after flexion, ridge-like along anterior cauda. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Shallow over anterior cauda, groove along antirostrum. **Ventral depression:** Absent, margin depressed. **Rostrum:** Broad, short and sharply rounded. **Antirostrum:** Small and pointed. **Excisura:** Moderately wide, notch shallow, angle acute.

#### *Lutjanus fulvus*, SSF No. 181.9 PLATE 78

**DISTRIBUTION:** Tropical Indo-West Pacific, south to the Bashee River. Attains 40 cm.

**MATERIAL:** 1/1 (6.8 mm OD, 143 mm TL), PEM 14561 (RUSI 31393); Mauritius; Id. MJS, PCH.

**Otolith shape:** Approximately oval-ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Lateral surface:** Grooved near dorsal margin. **Dorsal margin:** Raised and rounded, posterior corner angular; **sculpture**, crenate to irregular. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Oblique, sharply rounded and crenate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low anterior colliculum, very indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Oval with steep dorsal wall, ventral wall approximately straight. **Cauda:** Straight, sharply flexed in the second half and moderately deep. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.2. **Collum:** Absent. **Crista superior:** Well developed above ostium and after flexion, ridge-like above anterior cauda. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Approximately oval and shallow above anterior cauda. **Ventral depression:** Absent, shallow groove near margin from ostium to cauda. **Rostrum:** Short, broad and rounded. **Antirostrum:** Minute and rounded. **Excisura:** Moderately wide, notch very shallow, angle wide.

#### *Lutjanus gibbus*, SSF No. 181.10 PLATE 78

**DISTRIBUTION:** Red Sea and tropical Indo-West Pacific, south to Durban. Attains at least 40 cm.

**MATERIAL:** 5/14 (3.6-10.8 mm OD, 81-c.430 mm TL), PEM 15630, 9604, 15770, 8339, 5662; Comoro Ids, Kosi Bay and Natal; Id. MJS.

**Otolith shape:** Oval to ovate. **Thickness:** Moderately thick. **Form:** - Mesial very convex, - Lateral very concave. **Dorsal margin:** Rounded becoming slightly emarginate in centre; **sculpture**, irregular. **Ventral margin:** Slightly rounded and crenate anteriorly, serrate posteriorly. **Posterior margin:** Sharply rounded and dentate to irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph with low anterior colliculum, posterior colliculum becomes indistinct. **Pseudocolliculum:** Absent. **Ostium:** Oval, flared and deep, ventral wall poorly developed. **Cauda:** Sharply flexed and deep. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.3, 1:1.1, 1:0.9, 1:1.1, 1:1.1. **Collum:** Absent. **Crista superior:** Well developed along entire sulcus. **Crista inferior:** Poorly developed under ostium, well developed below cauda. **Dorsal depression:** Absent, deep groove along antirostrum, except in juvs. (c. 3.6 mm OD). **Ventral depression:** Absent, margin depressed, mainly under caudal tip. **Rostrum:** Short, broad and sharply rounded. **Antirostrum:** Very short and pointed. **Excisura:** Moderately wide, notch very shallow, angle acute.

#### *Lutjanus kasmira*, SSF No. 181.11 PLATE 78

**DISTRIBUTION:** Red Sea and tropical Indo-West Pacific, south to East London. Attains 33 cm.

**MATERIAL:** 6/43 (6.8-10.8 mm OD, 162-233 mm TL), PEM 14826 (RUSI 37090), 8305 (RUSI 34141), 8286, 8285 (RUSI 34172), 8405, 8178; Sodwana Bay, Kosi Bay and ORI; Id. MJS, PCH.

**Otolith shape:** Oval to rounded-ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Rounded; **sculpture**, dentate to irregular. **Ventral margin:** Well rounded and sinuate to irregular. **Posterior margin:** Oblique, sharply rounded and dentate or irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior low, posterior colliculum indistinct. **Pseudocolliculum:** Absent. **Ostium:** Short and oval, ventral edge straight. **Cauda:** Flexed along second half, moderately deep and tip closed. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.3, 1:1.2, 1:1.6, 1:1.3, 1:1.5, 1:1.3. **Collum:** Absent. **Crista superior:** Well developed over ostium and after flexion, may have low ridge over anterior cauda. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Very shallow over anterior cauda, shallow groove along antirostrum may extend along margin as far as flexion. **Ventral depression:** Absent, shallow groove along margin. **Rostrum:** Short, broad and sharply rounded. **Antirostrum:** Small and pointed. **Excisura:** Moderately wide, notch shallow, angle acute.

#### *Lutjanus lutjanus*, SSF No. 181.13 PLATE 78

**DISTRIBUTION:** Red Sea and tropical Indian Ocean south to Delagoa Bay and western tropical Pacific. Attains 33 cm.

**MATERIAL:** 2/2 (9.7 mm OD (0495 broken), 170-220 mm TL), PEM 0495, 8157 (RUSI 34084); Dar es Salaam, Kosi Bay; Id. PCH.

**Otolith shape:** Approximately oval-ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Rounded; **sculpture**, dentate or irregular. **Ventral margin:** Rounded or angled and slightly irregular. **Posterior margin:** Sharply rounded and dentate or irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph with low anterior, extremely indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Oval, filled with colliculum with steep dorsal wall. **Cauda:** Approximately straight, strongly flexed, tip may be slightly flared. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.6, 0495 broken. **Collum:** Absent, slight step up to cauda. **Crista superior:** Well developed along entire sulcus. **Crista inferior:** Well developed under entire sulcus. **Dorsal depression:** Absent, groove along antirostrum. **Ventral depression:** Absent, ventral margin depressed in region of caudal tip, may be a groove joining caudal tip. **Rostrum:** Moderate, broad and sharply rounded. **Antirostrum:** Small and pointed. **Excisura:** Moderately wide, notch shallow, angle acute.

#### *Lutjanus notatus*, SSF No. 181.15 PLATE 78

**DISTRIBUTION:** East African coast, south to Durban, also at Madagascar, Reunion and Mauritius. Attains 22 cm.

**MATERIAL:** 1/1 (11.18 mm OD, 255 mm TL), PEM 4611; Ledsman Shoal; Id. PCH.

**Otolith shape:** Approximately oval. **Thickness:** Thick. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Rounded, may be a mid-dorsal peak; **sculpture**, irregular. **Ventral margin:** Well rounded and serrate to irregular. **Posterior margin:** Oblique, blunt and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph with very low anterior, extremely indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Oval, anterior edge curved lip-like, moderately deep. **Cauda:** Gently flexed, moderately deep. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.8. **Collum:** Absent. **Crista superior:** Poorly developed above ostium, well developed over cauda. **Crista inferior:** Well developed along entire sulcus.



**Dorsal depression:** Absent, dorsal margin depressed and grooved. **Ventral depression:** Absent, ventral groove along entire margin, margin depressed near caudal tip. **Rostrum:** Short, broad and rounded. **Antirostrum:** Absent or minute and pointed. **Excisura:** Moderately wide, notch very shallow, angle wide.

#### *Lutjanus rivulatus*, SSF No. 181.16 PLATE 78

**DISTRIBUTION:** Throughout tropical Indo-West Pacific, south to Durban. Attains 60 cm.

**MATERIAL:** 2/2 (14.7, 16.0 mm OD, 455 mm TL, 6116 not measured), PEM 8171, 6116; Mbibi and Kosi Bay; Id. MJS.

**Otolith shape:** Approximately oval to ovate. **Thickness:** Thick. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Rounded; **sculpture**, dentate or irregular. **Ventral margin:** Slightly rounded and irregular. **Posterior margin:** Sharply rounded and crenate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Oval and elongate. **Cauda:** Short and flexed along its length, tip deeper. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:0.8, 1:0.9. **Collum:** Absent. **Crista superior:** Well developed above ostium and anterior cauda, ridge-like after flexion. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Shallow depression above flexion, groove along antirostrum, may extend as far as flexion. **Ventral depression:** Absent, margin slightly depressed under caudal tip. **Rostrum:** Moderate, broad and rounded. **Antirostrum:** Small and pointed. **Excisura:** Moderately wide, notch shallow, angle wide.

#### *Lutjanus russellii*, SSF No. 181.17 PLATE 78

**DISTRIBUTION:** Throughout tropical Indo-West Pacific, south to Durban. Attains 40 cm.

**MATERIAL:** 5/35 (8.6-10.87 mm OD, 206-260 mm TL), PEM 8729 (RUSI 37457), 8538, 8307, 8536, 8318; Kosi Bay and ORI; Id. MJS.

**Otolith shape:** Approximately oblong-ovate. **Thickness:** Thick. **Form:** - Mesial convex, - Lateral concave. **Lateral surface:** May be a ridge along postero-ventral corner. **Dorsal margin:** Rounded, raised anteriorly; **sculpture**, irregular. **Ventral margin:** Rounded and irregular. **Posterior margin:** Oblique and sharply rounded and dentate or serrate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, both colliculi very low. **Pseudocolliculum:** Absent. **Ostium:** Oval, flares slightly dorsally and ventrally, moderately deep. **Cauda:** Either approximately straight, flexed near tip or gently flexed along its length, moderately deep. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.1, 1:1.2, 1:1, 1:0.9, 1:1.3. **Collum:** Absent, slight step up to cauda. **Crista superior:** Well developed over ostium and after flexion, low ridge over anterior cauda. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Shallow, with deep groove along antirostrum as far as neck. **Ventral depression:** Absent, margin groove from ostium to caudal tip. **Rostrum:** Large, broad and sharply rounded or blunt. **Antirostrum:** Small and pointed. **Excisura:** Moderately wide, notch shallow, angle acute.

#### *Lutjanus sanguineus*, SSF No. 181.18 PLATE 78

**DISTRIBUTION:** Western Indian Ocean, south to Algoa Bay. Attains 80 cm.

**MATERIAL:** 4/5 (16.0-22.7 mm OD, 509-c. 730 mm TL), PEM 2783, 4425, 4424, 5964; Kosi Bay, Ledsman Shoal and Sodwana Bay; Id. MJS.

**Otolith shape:** Oval-ovate. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Well rounded; **sculpture**, slightly dentate or irregular. **Ventral margin:** Rounded and serrate or irregular. **Posterior margin:** Sharply

rounded, oblique and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, very low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Oval, flared, dorsal wall not steep. Colliculum becomes raised with growth and fills the ostium. **Cauda:** Gently flexed, deepens with growth, walls steep. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.1, 1:1.1, 1:1, 1:1.1. **Collum:** Absent. **Crista superior:** Poorly developed above ostium, ridge-like over cauda, becoming well developed with growth as dorsal depression becomes shallower (c. 22 mm OD). **Crista inferior:** Poorly developed below ostium, well developed below cauda. **Dorsal depression:** Shallow above anterior cauda and near flexion, may have pit above ostium. Margin groove may be present. **Ventral depression:** Absent, margin depressed below caudal tip. **Rostrum:** Large, broad and rounded. **Antirostrum:** Small and pointed. **Excisura:** Moderately wide, notch shallow, angle acute.

#### *Lutjanus sebae*, SSF No. 181.19 PLATE 79

**DISTRIBUTION:** Throughout tropical Indo-West Pacific, south to Durban. Attains 80 cm.

**MATERIAL:** 2/4 (7.1, 15.89 mm OD, 140, 470 mm TL), PEM 0498, 0443; ORI and East London Museum; Id. GJBR.

**Otolith shape:** Oval-ovate. **Thickness:** Moderately thin. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Rounded; **sculpture**, crenate to irregular. **Ventral margin:** Rounded and crenate to irregular. **Posterior margin:** Oblique and bluntly rounded, crenate to irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low anterior and posterior colliculi. **Pseudocolliculum:** Absent. **Ostium:** Oval and moderately elongate. **Cauda:** Short, flexed along its length and moderately deep. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.3, 1:1. **Collum:** Absent. **Crista superior:** Poorly developed above anterior ostium, ridge-like elsewhere. **Crista inferior:** Poorly developed under anterior ostium, well developed elsewhere. **Dorsal depression:** Oval above anterior cauda. **Ventral depression:** Absent, margin depressed under caudal tip. **Rostrum:** Large, broad and rounded. **Antirostrum:** Small and pointed. **Excisura:** Moderate, notch shallow, angle acute.

#### *Macolor niger*, SSF No. 181.20 PLATE 79

**DISTRIBUTION:** Tropical Indo-Pacific to Sodwana Bay; rare, one juvenile found at Durban. Attains 75 cm.

**MATERIAL:** 2/2 (11.12, 11.51 mm OD, 454, 575 mm TL), PEM 0862, 15484 (RUSI 40615); Durban, ORI; Id. SAC, PCH, GJBR.

**Otolith shape:** Approximately obovate to oblong. **Thickness:** Moderately thick. **Form:** - Mesial very convex, - Lateral very concave. **Lateral surface:** May be a lip on the postero-dorsal corner. **Dorsal margin:** Rounded and flattened anteriorly; **sculpture**, dentate and irregular. **Ventral margin:** Rounded and notched posteriorly, dentate to crenate. **Posterior margin:** Rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Broad and flared dorsally, dorsal edge of rostrum may be raised. **Cauda:** Wide, deep, flexed along length, walls angled and rough. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.4, 1:1.5. **Collum:** Absent. **Crista superior:** Moderately well developed along sulcus. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Absent. **Ventral depression:** Margin depressed and may be notched under caudal tip. **Rostrum:** Short, broad and rounded. **Antirostrum:** Small and pointed. **Excisura:** Moderately wide, notch shallow, angle variable.



**DISTRIBUTION:** Widely distributed in the tropical Indo-Pacific from Samoa to the Laccadive Ids and Chagos Archipelago; ranging northwards to the Ryuku Ids. Attains 40 cm TL (Allen 1985).

**MATERIAL:** 2/2 (8.7, 8.84 mm OD, 350, 360 mm TL), PEM 8188 (RUSI 38882), 15377; Ledsman Shoal, Sodwana Bay, Natal; Id. PCH, WDA.

**Otolith shape:** Oval-ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Rounded; **sculpture**, crenate to digitate and irregular. **Ventral margin:** Slightly rounded and crenate or slightly irregular. **Posterior margin:** Oblique, pointed and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior low, posterior colliculum indented, margin raised. **Pseudocolliculum:** Absent. **Ostium:** Oblong, cup-like flare dorsally. **Cauda:** Straight, slightly flared at tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.6, 1:1.2. **Collum:** Absent, step up to cauda. **Crista superior:** Well developed or low ridge along entire sulcus. **Crista inferior:** Well developed along entire sulcus, may be poorly developed under anterior ostium. **Dorsal depression:** Absent, may be a short groove along antirostrum. **Ventral depression:** Distinct and elongate, deep depression under caudal tip from postero-ventral corner of otolith. **Rostrum:** Large, may be broad and rounded. **Antirostrum:** Moderate, rounded or sharply rounded. **Excisura:** Wide, notch moderate, angle acute.

*Paracaesio xanthura*, SSF No. 181.21 PLATE 79

**DISTRIBUTION:** Tropical Indo-West Pacific; extends south to Durban. Attains 45-50 cm.

**MATERIAL:** 4/8 (8.7-10.9 mm OD, 350-495 mm TL), PEM 8205, 8618, 8189, 14858 (RUSI 35533); Ramsgate, Kosi Bay and Sodwana Bay; Id. MJS, PCH, WDA.

**Otolith shape:** Oval (<9 mm OD), becoming fusiform. **Thickness:** Moderately thick. **Form:** - Mesial very convex, - Lateral concave. **Dorsal margin:** Rounded; **sculpture**, dentate to irregular. **Ventral margin:** Slightly rounded or flattened, slightly crenate or slightly irregular. **Posterior margin:** Rounded becoming pointed and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph with low anterior colliculum, posterior with margin visible and floor uneven. **Pseudocolliculum:** Absent. **Ostium:** Elongate, deep, flares dorsally and ventrally, lies mainly on rostrum. **Cauda:** Elongate, approximately straight, flexed near tip and moderately deep. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.9, 1:1.2, 1:1.4, 1:1.3. **Collum:** Absent, step up to cauda. **Crista superior:** Well developed (<9 mm OD), becoming ridge-like along entire sulcus. **Crista inferior:** Well developed or ridge-like below ostium, ridge-like under cauda. **Dorsal depression:** Shallow from ostium to flexion. **Ventral depression:** Under caudal tip (<9 mm OD), under ostium and caudal tip (>9 mm OD), may join margin groove. **Rostrum:** Large, broad, becoming elongate and rounded. **Antirostrum:** Moderate and pointed. **Excisura:** Wide, notch deep, angle acute.

*Pristipomoides argyrogrammicus* (Valenciennes, 1831)

SSF No. 181.— PLATE 79

**DISTRIBUTION:** Widespread in the Indo-West Pacific from Samoa to Mauritius and from New Caledonia northwards to southern Japan. Attains 40 cm TL, common to 25 cm (Allen 1985).

**MATERIAL:** 1/1 (9.7 mm OD, 185 mm TL), PEM 14523 (RUSI 31445); Mauritius; Id. MJS, PCH, WDA.

**Otolith shape:** Approximately rhomboidal. **Thickness:** Moderately thick. **Form:** - Mesial slightly convex, - Lateral slightly concave anteriorly, convex posteriorly. **Dorsal margin:** Raised,

angled and flattened; **sculpture**, slightly irregular. **Ventral margin:** Well rounded and slightly irregular. **Posterior margin:** Oblique and rounded and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior raised, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Oval, slightly angled dorsally. **Cauda:** Dorsal wall very slightly flexed, tip poorly defined. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.4. **Collum:** Absent, slight step up to cauda. **Crista superior:** Moderately well developed above ostium and after flexion, ridge-like above anterior cauda, absent at tip. **Crista inferior:** Well developed under entire sulcus. **Dorsal depression:** Oval and shallow from neck to flexion. **Ventral depression:** Absent, groove near margin from ostium to caudal tip. **Rostrum:** Short, broad and sharply rounded. **Antirostrum:** Minute and rounded. **Excisura:** Moderately wide, notch very shallow, angle wide.

*Pristipomoides filamentosus*, SSF No. 181.22 PLATE 79

**DISTRIBUTION:** Tropical Indo-Pacific; extends south to East London. Attains 90-100 cm.

**MATERIAL:** 4/13 (7.2-13.7 mm OD, 180-585 mm TL), PEM 14521 (RUSI 31387), 2782, 5680, 8376; Kosi Bay, Sodwana Bay, Mauritius; Id. MJS, PCH, WDA.

**Otolith shape:** Rhomboidal (<9 mm OD) becoming fusiform. **Thickness:** Moderately thin. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Rounded; **sculpture**, digitate and very irregular. **Ventral margin:** Angled (<9 mm OD) becoming slightly rounded, serrate anteriorly, digitate posteriorly. **Posterior margin:** Oblique and rounded becoming pointed with growth, and very irregular. **Sulcus acusticus:** Ostial, cauda open, may appear ostio-caudal, heterosulcoid. **Colliculum:** Heteromorph with anterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Oval, deep, lies mainly along rostrum. **Cauda:** Gently flexed, deep and tip may open to ventral depression. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.4, 1:1.4, 1:1.1, 1:1.2. **Collum:** Absent, slight step up to cauda. **Crista superior:** Above ostium poorly developed (<9 mm OD), ridge-like in large otoliths; ridge-like along cauda. **Crista inferior:** Well developed along ostium and cauda. **Dorsal depression:** Oval and shallow from ostium to flexion. **Ventral depression:** Margin depressed from below neck to caudal tip, depression broad. **Rostrum:** Long, broad and usually pointed, may be sharply rounded. **Antirostrum:** Small and pointed. **Excisura:** Moderate becoming wide, notch shallow, angle acute.

*Pristipomoides zonatus*, SSF No. 181.24 PLATE 79

**DISTRIBUTION:** Tropical Indo-Pacific from Delagoa Bay to Hawaii. Attains 50 cm.

**MATERIAL:** 3/3 (11.0-16.9 mm OD, 232-475 mm TL), PEM 14537 (RUSI 31429), 15610, 15600; Mauritius, Comoro Ids; Id. MJS, PCH, lodged in JLSII.

**Otolith shape:** Approximately rhomboidal becoming oblong. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Raised and flattened, becoming slightly rounded; **sculpture**, slightly irregular becoming notched and irregular. **Ventral margin:** Rounded, crenate and irregular. **Posterior margin:** Rounded and crenate to irregular and notched. **Sulcus acusticus:** Ostial, but caudal tip not closed, heterosulcoid. **Colliculum:** Heteromorph, anterior colliculum oval and raised, posterior low and indented. **Pseudocolliculum:** Absent. **Ostium:** Oval, moderately deep. **Cauda:** Deep, narrow and almost straight, tip indistinct, ends close to margin. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.3, 1:1.2, 1:1.2. **Collum:** Absent, slight step up to cauda. **Crista superior:** Poorly developed above anterior ostium and near tip, ridge-like along anterior cauda, absent at tip. **Crista inferior:** Poorly developed



under ostium, well developed under cauda. **Dorsal depression:** Oval, above anterior cauda. **Ventral depression:** Absent, margin groove in large otoliths. **Rostrum:** Short, broad and sharply rounded, may have slight dorsal flexion. **Antirostrum:** Absent or minute and rounded. **Excisura:** Moderate, notch very shallow, angle wide.

**CAESIONIDAE Nelson No. 317**

**Family characteristics:** Only one species available. Otoliths oblong up to at least 9 mm OD. Margins crenate to irregular; not highly indented or digitate. Heterosulcoid, ostium oblong, cauda flexed along its length. Heteromorph, low anterior, indistinct posterior colliculum. Ventral depression below caudal tip. Otolith form similar to Lutjanidae.

***Caesio teres*, SSF No. 182.2 PLATE 80**

**DISTRIBUTION:** Seychelles and Kenya to Sodwana Bay. Attains 30 cm.

**MATERIAL:** 1/1 (8.98 mm OD, 334 mm TL), PEM 2751; Sodwana Bay; Id. MMS, GRA.

**Otolith shape:** Oblong. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral concave. **Lateral surface:** Slightly raised ridge near postero-ventral corner. **Dorsal margin:** Slightly rounded; **sculpture**, crenate to irregular. **Ventral margin:** Slightly rounded, slightly notched under caudal tip and irregular. **Posterior margin:** Sharply rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior colliculum low, posterior indistinct, indented. **Pseudocolliculum:** Absent. **Ostium:** Approximately oblong, shallow. **Cauda:** Flexed gently along its length, deepest at tip. **Ostio-caudal differentiation:** Slight dorso-ventral constrictions. **Ostium/cauda:** 1:0.8. **Collum:** Absent, step up to cauda. **Crista superior:** Poorly developed above anterior ostium, well developed elsewhere. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Absent. **Ventral depression:** Absent, may have a postero-ventral depression below caudal tip. **Rostrum:** Short, broad and rounded. **Antirostrum:** Minute and rounded. **Excisura:** Moderately wide, notch very shallow, angle wide.

**LOBOTIDAE Nelson No. 318**

**Family characteristics:** Only one species. Otoliths oblong up to c. 20 mm OD. Heterosulcoid, ostial opening, cauda closed, ending near margin. Ostium flared dorsally, wall irregular. Heteromorph with distinct but low colliculi. Dorsal and ventral margins of otolith approximately parallel, margins irregular and ventral area often crystalline.

***Lobotes surinamensis*, SSF No. 202.1 PLATE 80**

**DISTRIBUTION:** Found in tropical and subtropical waters of all oceans, in this area from Kromme River (Cape St Francis) northwards. Attains 100 cm.

**MATERIAL:** 5/14 (9.4-20.0 mm OD, 391-790 mm TL), PEM 5689, 14805, 14861 (RUSI 35532), 5903, 8549; Kosi Bay, Richards Bay, Durban and southern Cape; Id. MJS, PCH.

**Otolith shape:** Oblong. **Thickness:** Moderately thick. **Form:** - Mesial strongly convex, - Lateral strongly concave. **Dorsal margin:** Slightly raised, flat or notched; **sculpture**, Dentate, crenate or irregular. **Ventral margin:** Slightly rounded or flat and irregular or crenate. **Posterior margin:** Rounded or crenate or lobed. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, both anterior and posterior colliculi low but distinct. **Pseudocolliculum:** Absent. **Ostium:** Oval, dorsal wall distinctly flared anteriorly and irregular. **Cauda:** Straight, deepening and flexed near tip, ends near margin. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.2, 1:1.3, 1:1.1,

1:1.5, 1:1.4. **Collum:** Absent. **Crista superior:** Well developed along sulcus, poorly developed at tip. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Very shallow and elongate above crista. **Ventral depression:** Absent. **Rostrum:** Broad and sharply rounded. **Antirostrum:** Absent or minute. **Excisura:** Moderately wide, notch very shallow, angle wide.

**GERREIDAE Nelson No. 319**

**Family characteristics:** Otolith shape either oval to oval-ovate or oblong up to c. 8.7 mm OD. Heterosulcoid, either ostial or ostio-caudal openings. Heteromorph, low anterior and indistinct posterior colliculi. Cristae well developed to ridge-like over cauda. A gap in neck area and ostium poorly defined. Ventral area distinctly and broadly depressed along entire ventral margin. These otoliths form two distinct groups, as shown by the key.

**Key**

- 1a. Otolith oblong; dorsal margin of otolith slightly rounded or domed; cauda approximately straight . . . . . 2
- 1b. Otolith approximately oval to oval-ovate; dorsal margin of otolith slightly rounded; cauda distinctly flexed at tip . . . . . 3
- 2a. Dorsal margin of otolith domed; sulcus runs along dorsal margin; sulcus opening ostial; caudal tip closed just short of posterior margin; crista inferior continuous between ostium and cauda . . . . . *Gerres oyena* 194.4
- 2b. Dorsal margin of otolith slightly rounded; sulcus runs along midline of otolith; sulcus opening ostio-caudal; cauda opens onto postero-ventral margin; crista inferior and superior ridge-like along cauda with distinct gap in cristae between ostium and cauda . . . . . *Gerres rappi* 194.5
- 3a. Posterior margin of otolith sharply rounded; dorsal margin of otolith slightly rounded, may be indented; sulcus lies close to dorsal margin . . . . . *Gerres acinaces* 194.1
- 3b. Posterior margin of otolith rounded; dorsal margin rounded; sulcus more centrally placed . . . . . 4
- 4a. Sulcus with low collum in neck; caudal tip sharply flexed; caudal tip slightly more elongate; no groove or depression under anterior cauda . . . . . *Gerres filamentosus* 194.2
- 4b. Sulcus with no collum present in neck, step up to cauda in large otoliths; cauda sharply flexed, almost right-angled in juveniles; caudal tip short; shallow, short groove under anterior cauda . . . *Gerres oblongus* 194.3

***Gerres acinaces*, SSF No. 194.1 PLATE 80**

**DISTRIBUTION:** Tropical Indo-Pacific south to Algoa Bay. Attains 25 cm.

**MATERIAL:** 3/5 (3.95-8.7 mm OD, 107-320 mm TL), PEM 15449 (RUSI 40567), 15343, 14575; Mauritius, Kosi System and ORI; Id. MJS, DC, PCH.

**Otolith shape:** Oval to oval-ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded and indented; **sculpture**, irregular. **Ventral margin:** Rounded and irregular. **Posterior margin:** Sharply rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph with low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Oval, poorly defined, widely separated from cauda by collum. **Cauda:** Sinuous, strongly flexed and deep. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:2.1, 1:1.7, 1:1.4. **Collum:** Low and rounded wall-like structure reaching level of ventral area, separates ostium and cauda. **Crista superior:** Poorly developed above ostium, ridge-like above cauda. **Crista inferior:** Poor under



ostium, ridge-like under anterior cauda becoming well developed but absent at tip. **Dorsal depression:** Elongate from front of otolith to caudal flexion. **Ventral depression:** Ventral area elevated, plateau-like, along cauda; ventral margin widely depressed. **Rostrum:** Short, broad, may be pointed or blunt. **Antirostrum:** Small and pointed. **Excisura:** Moderately wide, notch moderate, angle acute.

*Gerres filamentosus*, SSF No. 194.2 PLATE 80

**DISTRIBUTION:** Indo-Pacific, common in northern part of this area; strays as far south as Algoa Bay. Attains 25 cm.

**MATERIAL:** 3/11 (3.65-5.7 mm OD, 115-155 mm TL), PEM 15345, 1021, 0362; Natal, Swartkops and Kosi System; Id. GJBR, ALB, DC.

**Otolith shape:** Oval to oval-ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Rounded; sculpture, slightly irregular. **Ventral margin:** Rounded, dentate and irregular. **Posterior margin:** Rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior colliculum slightly raised, posterior indented and indistinct. **Pseudocolliculum:** Absent. **Ostium:** Approximately oval and short. **Cauda:** Narrow, slightly sinuous, strongly flexed. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:1.8, 1:1.7, 1:1.5. **Collum:** Low, separates ostium and cauda. **Crista superior:** Very poor over ostium, ridge-like above cauda to flexion, well developed after flexion. **Crista inferior:** Well developed under ostium, ridge-like at neck, well developed to tip. **Dorsal depression:** Shallow, over crista, poorly defined. **Ventral depression:** Absent, ventral area broadly depressed at margin. **Rostrum:** Short, broad and pointed. **Antirostrum:** Small and pointed. **Excisura:** Moderately wide, notch shallow, angle acute.

*Gerres oblongus*, SSF No. 194.3 PLATE 80

**DISTRIBUTION:** Tropical Indo-Pacific south to Kosi Bay. Attains 30 cm.

**MATERIAL:** 4/11 (2.4-7.2 mm OD, 55-242 mm TL), PEM 2067, 2066, 15346, 5972; Natal, Kosi System and ORI; Id. PCH, DC.

**Otolith shape:** Oval to oval-ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Rounded becoming notched with growth; sculpture, irregular. **Ventral margin:** Rounded and crenate to irregular. **Posterior margin:** Rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, a low anterior, indented and indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Approximately oval and short. **Cauda:** Slightly sinuous then sharply flexed, almost right-angled in juveniles (<4 mm OD), tip short. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:1.9, 1:1.6, 1:1.9, 1:1.4. **Collum:** Absent, step up to cauda in large otoliths (c. 7 mm OD). **Crista superior:** Very poor above ostium, ridge-like elsewhere, poor to absent at tip. **Crista inferior:** Well developed under ostium, poor at neck, anterior cauda ridge-like becoming well developed posteriorly. **Dorsal depression:** Elongate from neck to flexion. **Ventral depression:** Shallow, short groove under anterior cauda, ventral area broadly depressed near margin. **Rostrum:** Short, broad and sharply rounded. **Antirostrum:** Small, sharply rounded or pointed. **Excisura:** Moderately wide, notch moderate, angle wide.

*Gerres oyna*, SSF No. 194.4 PLATE 81

**DISTRIBUTION:** Tropical Indo-Pacific, south to Kosi Bay. Attains 25 cm.

**MATERIAL:** 5/5 (4.1-5.58 mm OD, 115-183 mm TL), 0609H, 0611H, 0610H, PEM 15729 & 15728 (both RUSI 42707); Red Sea; Id. IP, HM, PCH.

**Otolith shape:** Approximately oblong. **Thickness:** Thick, wing-like ventro-lateral wing along otolith. **Form:** - Mesial convex, - Lateral slightly concave. **Lateral surface:** Long ventro-lateral wing present. **Dorsal margin:** Slightly rounded, domed in centre; sculpture, slightly irregular. **Ventral margin:** Slightly rounded or flattened and approximately entire. **Posterior margin:** Sharply rounded or pointed and entire or slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior colliculum may penetrate excisura, posterior indistinct. **Pseudocolliculum:** Absent. **Ostium:** Flared dorsally. **Cauda:** Narrow, flexed slightly near tip, ends near postero-dorsal margin. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.7, 1:1.9, 1:1.9, 1:1.4, 1:1.4. **Collum:** Absent, step up to cauda. **Crista superior:** Ridge-like above posterior ostium and over cauda. **Crista inferior:** Poorly developed under ostium, anterior cauda ridge-like, well developed posteriorly. **Dorsal depression:** Oval and elongate above cauda, dorsal area extremely reduced, but with central dome. **Ventral depression:** Absent, a groove below crista, ventral area broadly depressed at margin. **Rostrum:** Broad and sharply rounded or pointed. **Antirostrum:** Absent. **Excisura:** Moderately wide, notch absent.

*Gerres rappa*, SSF No. 194.5 PLATE 81

**DISTRIBUTION:** Apparently a temperate species ranging from Algoa Bay into southern Mozambique; also reported from Madagascar. Attains 30 cm.

**MATERIAL:** 3/7 (5.28-7.26 mm OD, 82-121 mm SL), PEM 15348, 0141H, 15347; Kosi system and Swartkops; Id. DC, TH.

**Otolith shape:** Oblong. **Thickness:** Moderate. **Form:** - Mesial approximately flat, - Lateral flat. **Lateral surface:** Steep ventral edge. **Dorsal margin:** Slightly rounded; sculpture, slightly irregular. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Sharply rounded and irregular. **Sulcus acusticus:** Ostio-caudal, heterosulcoid. **Colliculum:** Heteromorph, very low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Approximately oval. **Cauda:** Separated from ostium, slightly angled ventrally, approximately straight, opens onto postero-ventral margin. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:1.6, 1:1.4, 1:1.5. **Collum:** Absent, step up to cauda. **Crista superior:** Poor above ostium, ridge-like along cauda, absent at anterior cauda and tip. **Crista inferior:** Low ridge under ostium, high ridge below cauda but absent at anterior cauda and tip. **Dorsal depression:** Elongate and deep along narrow dorsal area. **Ventral depression:** Deep below ostium, broadens under cauda; ventral area reduced and narrow. **Rostrum:** Large, broad and sharply rounded. **Antirostrum:** Small and pointed. **Excisura:** Moderate, notch shallow, angle acute.

HAEMULIDAE Nelson No. 320

**Family characteristics:** Differences in the otoliths suggest that the genus *Pomadasy* should be placed in a different family, or least subfamily.

*Plectorhinchus* and *Diagramma*: Otoliths oblong up to c. 17 mm. Heterosulcoid with ostial openings. Ostium flared dorsally and ventrally, elongate. Cauda strongly flexed, often recurved. Heteromorph, low anterior, indistinct posterior colliculi.

*Pomadasy*: Otoliths approximately rounded-oval, well rounded ventral margins, up to c. 26 mm OD. Heterosulcoid with ostial openings. Ostium oval to oblong with ventral wall approximately horizontal. Cauda gently curved or strongly flexed, none recurved. Heteromorph, low colliculi.

**Key**

- 1a. Otolith oblong . . . . . 2
- 1b. Otolith oval . . . . . 10
- 2a. Ostium short, widely flared . . . . . 3



- 2b. Ostium moderate to elongate . . . . . 4
- 3a. Ostium very short, V-shaped; cauda recurved with narrow tip; groove under cauda to flexion; posterior margin oblique and bluntly rounded . . . . . *Plectorhinchus schotaf* 179.8
- 3b. Ostium more elongate, less V-shaped; cauda strongly recurved; groove from ventral margin to caudal tip; posterior margin of otolith blunt . . . . . *Plectorhinchus playfairi* 179.7
- 4a. Cauda strongly recurved; depressed posterior margin . . . . . 5
- 4b. Cauda curved or somewhat recurved; posterior margin not depressed . . . . . 6
- 5a. Posterior margin sharply rounded; caudal tip recurved but not narrowed; crista superior with break or several breaks along ridge; dorsal depression oval and very shallow . . . . . *Diagramma pictum* 179.1
- 5b. Posterior margin sharply rounded or blunt; caudal tip narrow and recurved; crista superior continuous along sulcus; dorsal depression distinct and postero-ventral margin angled and depressed . . . . . *Plectorhinchus chubbi* 179.2
- 6a. Dorsal margin of otolith flattened . . . . . 7
- 6b. Dorsal margin of otolith slightly rounded . . . . . 8
- 7a. Posterior margin sharply rounded, rounded or blunt but wide; caudal flexion close to posterior margin; caudal tip moderately close to ventral margin . . . . . *Plectorhinchus flavomaculatus* 179.3
- 7b. Posterior margin narrows but blunt; caudal flexion far from posterior margin; caudal tip ends very close to ventral margin . . . . . *Plectorhinchus plagiodesmus* 179.6
- 8a. Caudal flexion right-angled with short recurved tip; ventral area uneven, rippled appearance . . . . . *Plectorhinchus sordidus* 179.9
- 8b. Cauda flexed but not right-angled, tip more elongate; ventral area may be uneven, not rippled . . . . . 9
- 9a. Cauda recurved with blunt deep tip; no depression under flexion; rostrum sharply rounded . . . . . *Plectorhinchus gaterinus* 179.4
- 9b. Cauda with shorter recurved tip; depression or groove under crista at flexion; rostrum pointed . . . . . *Plectorhinchus gibbosus* 179.5
- 10a. Dorsal margin of otolith flat; otolith oblong, appears elongate . . . . . *Pomadasys striatum* 179.18
- 10b. Dorsal margin raised or rounded; otoliths rounded-oval appears broad and rounded . . . . . 11
- 11a. Ostium short and broad . . . . . 12
- 11b. Ostium moderate to elongate and narrow . . . . . 13
- 12a. Dorsal margin of otolith rounded or slightly angled; postero-ventral corner of ostium c. right-angled; cauda very short, straight initially, flexed in posterior third, tip short . . . . . *Pomadasys olivaceum* 179.17
- 12b. Dorsal margin raised and angled; postero-ventral corner of ostium bulges posteriorly; cauda sharply flexed, almost right-angled, tip elongate . . . . . *Pomadasys maculatum* 179.15
- 13a. Dorsal margin of otolith raised and angled . . . . . 14
- 13b. Dorsal margin of otolith rounded, may be slightly raised . . . . . 15
- 14a. Ventral margin of otolith well rounded to bulbous; ventral margin of ostium sinuous; cauda curved along its length, tip not pointed . . . . . *Pomadasys commersonnii* 179.10
- 14b. Ventral margin of otolith rounded; ventral margin of ostium straight; cauda curved more strongly with elongate tip narrow and pointed . . . . . *Pomadasys furcatum* 179.11
- 15a. Cauda gently curved along its length, narrowing to tip; ventral area very broad and rounded . . . . . *Pomadasys multimaculatum* 179.16
- 15b. Cauda flexed either at half its length or near tip; ventral area narrower . . . . . 16
- 16a. Ostium relatively broad (cf. 179.13), postero-ventral corner of ostium with posterior lobe; flexion near caudal tip; ventral margin groove from under ostium, under caudal tip around to depressed posterior margin; posterior margin tapered and oblique . . . . . *Pomadasys stridens* 179.19
- 16b. Ostium relatively narrow, postero-ventral corner of ostium rounded not lobed posteriorly; flexion of cauda at half its length; ventral margin groove absent, posterior margin without depression; posterior margin broad and rounded . . . . . *Pomadasys kaakan* 179.13

#### *Diagramma pictum*, SSF No. 179.1 PLATE 81

DISTRIBUTION: Indo-West Pacific to Natal. Attains c. 1 m.  
 MATERIAL: 3/3 (15.4-16.4 mm OD; 635-700 mm TL), PEM 5933, 5678, 5677; Zululand and Durban; Id. MJS.  
**Otolith shape:** Approximately oblong. **Thickness:** Moderately thick. **Form:** - **Mesial** slightly convex, - **Lateral** slightly concave. **Dorsal margin:** Rounded; **sculpture**, slightly irregular. **Ventral margin:** Slightly rounded and crenate to slightly irregular. **Posterior margin:** Sharply rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, with very low anterior, indistinct and low posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Oval, ventral wall angled. **Cauda:** Straight, becoming strongly flexed with steep walls posteriorly, recurved near tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.2, 1:1.3, 5933 broken. **Collum:** Absent. **Crista superior:** Well developed over ostium, may be ridge-like over anterior cauda (possibly discontinuous), well developed after flexion. **Crista inferior:** Poorly developed under ostium, well developed to ridge-like under anterior cauda, well developed after flexion. **Dorsal depression:** Oval and very shallow. **Ventral depression:** Absent, but may be small depression postero-ventral to caudal tip. **Rostrum:** Broad and sharply rounded. **Antirostrum:** Small and pointed. **Excisura:** Moderately wide, notch shallow, angle acute.

#### *Plectorhinchus chubbi*, SSF No. 179.2 PLATE 81

DISTRIBUTION: Transkei to Kenya and India. Attains 75 cm.  
 MATERIAL: 3/7 (4.45-11.12 mm OD, 131-584 mm TL), PEM 0457, 6153, 0727; Durban; Id. MJS, GJBR, RvdE.  
**Otolith shape:** Oval to oblong. **Thickness:** Moderate. **Form:** - **Mesial** convex, - **Lateral** concave. **Dorsal margin:** Slightly rounded or flattened; **sculpture**, crenate or irregular. **Ventral margin:** Flattened and slightly crenate to irregular. **Posterior margin:** Sharply rounded or blunt and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior colliculum slightly raised, posterior low and indistinct. **Pseudocolliculum:** Absent. **Ostium:** Oval, V-shaped posteriorly, ventral wall angled ventrally. **Cauda:** Straight becoming strongly flexed, deeper and recurved with narrow tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.1, 1:1.3, 1:0.9. **Collum:** Absent, step up to cauda. **Crista superior:** Poorly developed above ostium, ridge-like above anterior cauda, well developed after flexion. **Crista inferior:** Poorly developed below ostium, ridge-like below cauda but well-developed after flexion. **Dorsal depression:** Shallow and elongate. **Ventral de-**



**pression:** May have groove, and may be a groove close to margin. **Rostrum:** Large and sharply rounded. **Antirostrum:** Absent or small and sharply rounded. **Excisura:** Moderately wide, notch shallow, angle acute or wide.

*Plectorhinchus flavomaculatus*, SSF No. 179.3

PLATE 81

**DISTRIBUTION:** Indo-West Pacific, Red Sea to Transkei. Attains at least 60 cm.

**MATERIAL:** 4/6 (9.1-11.0 mm OD, 369-557 mm TL) PEM 8500, 15401 (RUSI 40604), 0656H, 6778, [15378 (RUSI 40573)]; Sodwana, Madagascar and ORI; Id. TH, MJS.

**Otolith shape:** Oval to oblong. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Flat or slightly rounded; **sculpture**, crenate or irregular. **Ventral margin:** Slightly rounded and crenate or irregular. **Posterior margin:** Sharply rounded, rounded or blunt and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Oblong, flared dorsally and ventrally. **Cauda:** Straight then strongly flexed and recurved, steep walls. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.1, 1:1.4, 1:1, 1:1.2. **Collum:** Absent, step up to cauda. **Crista superior:** Well developed along entire sulcus. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Elongate over most of dorsal area or small and shallow at flexion. **Ventral depression:** Absent, groove close to flexion. **Rostrum:** Large and sharply rounded. **Antirostrum:** Small and pointed. **Excisura:** Moderately wide, notch shallow, angle acute.

*Plectorhinchus gaterinus*, SSF No. 179.4 PLATE 81

**DISTRIBUTION:** Red Sea south to Natal, Mauritius, Madagascar and Comoro Ids.

**MATERIAL:** 2/4 (6.68, 12.68 mm OD, 180 mm TL, 1056H not recorded), PEM 0500, 1056H; East London, Red Sea; Id. CP, MJS.

**Otolith shape:** Oval to oblong. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded; **sculpture**, crenate to irregular. **Ventral margin:** Slightly rounded; crenate or irregular. **Posterior margin:** Sharply rounded; slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low anterior, indistinct nodular posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Approximately oval, large and deep. **Cauda:** Straight then strongly flexed with blunt and deep tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.4, 1:1.2. **Collum:** Absent. **Crista superior:** Well developed over ostium, ridge-like along straight section of cauda (juvs), well developed after flexion. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Small and oval, close to margin, distinct in large otoliths. **Ventral depression:** Absent, may be shallow groove or pit anterior to caudal tip. **Rostrum:** Large broad and sharply rounded. **Antirostrum:** Absent (<12 mm OD), becoming small and pointed. **Excisura:** Moderately wide, notch may be absent in small otoliths, moderate in adults, angle acute.

*Plectorhinchus gibbosus*, SSF No. 179.5 PLATE 82

**DISTRIBUTION:** Indo-West Pacific, south to Natal. Attains 75 cm.

**MATERIAL:** 3/3 (6.92-13.3 mm OD, 180-612 mm TL), PEM 0729, 7453, 7454; Kosi Bay and Durban; Id. MJS.

**Otolith shape:** Oval to oblong. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded to flattened; **sculpture**, dentate to crenate. **Ventral margin:** Rounded and irregular. **Posterior margin:** Oblique, sharply

rounded and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior colliculum protrudes through excisura, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Approximately oval, long ventral, short dorsal wall. **Cauda:** Straight, strongly flexed and slightly recurved. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1, 1:1.2, 1:1.1. **Collum:** Absent. **Crista superior:** Poorly developed over ostium, low ridge over cauda (<. 7 mm OD), well developed along entire sulcus in large otoliths. **Crista inferior:** Poorly developed under ostium, well developed to ridge-like under anterior cauda, well developed under flexion. **Dorsal depression:** Elongate in small otoliths, absent in large otoliths. **Ventral depression:** Elongate and shallow below flexion, may be shallow groove in mid-ventral area. **Rostrum:** Large, broad and pointed. **Antirostrum:** Small and pointed. **Excisura:** Moderately wide, notch shallow, angle acute.

*Plectorhinchus plagiodesmus*, SSF No. 179.6 PLATE 82

**DISTRIBUTION:** Somalia to Madagascar and Natal. Attains c. 90 cm.

**MATERIAL:** 1/1 (11.02 mm OD, 420 mm TL), PEM 15483 (RUSI 40616); Natal south coast; Id. MJS, PCH.

**Otolith shape:** Oblong. **Thickness:** Moderate. **Form:** - Mesial very convex, - Lateral very concave. **Dorsal margin:** Slightly rounded to flat; **sculpture**, crenate to lobed. **Ventral margin:** Rounded and crenate. **Posterior margin:** Blunt and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior colliculum low and nodular, posterior low and indented. **Pseudocolliculum:** Absent. **Ostium:** Oblong, flared dorsally. **Cauda:** Straight, flexed and recurved near tip with shallow papilla at tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1. **Collum:** Absent. **Crista superior:** Well developed over ostium and after flexion, ridge-like over anterior cauda. **Crista inferior:** Well developed from ostium to cauda along entire sulcus. **Dorsal depression:** Oval above anterior cauda. **Ventral depression:** Absent, shallow groove under ostium. **Rostrum:** Moderate and broad, slightly tapered, sharply rounded. **Antirostrum:** Short, tapered and sharply rounded. **Excisura:** Wide, notch shallow, angle acute.

*Plectorhinchus playfairi*, SSF No. 179.7 PLATE 82

**DISTRIBUTION:** Western Indian Ocean, south to Port St Johns, Transkei. Attains 90 cm.

**MATERIAL:** 1/1 (12.0 mm OD, 590 mm TL), PEM 8249; Kosi Bay; Id. MJS.

**Otolith shape:** Oval to oblong. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Flattened; **sculpture**, crenate. **Ventral margin:** Slightly rounded to flattened and slightly crenate. **Posterior margin:** Blunt and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Oval and wide, colliculum protrudes through excisura. **Cauda:** Straight anteriorly, strongly recurved posteriorly, tip close to ventral margin, intersected by diagonal grooves. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.2. **Collum:** Absent. **Crista superior:** Poorly developed over ostium, ridge-like along anterior cauda, well developed after flexion. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Absent, area slightly irregular. **Ventral depression:** Absent, diagonal groove intersects caudal tip. **Rostrum:** Large, broad and pointed. **Antirostrum:** Small and pointed. **Excisura:** Moderately wide, notch shallow, angle acute.



***Plectorhinchus schotaf*, SSF No. 179.8 PLATE 82**

**DISTRIBUTION:** Indo-West Pacific, south to Port St Johns. Rarely exceeds 40 cm.

**MATERIAL:** 1/2 (12.1 mm OD, 670 mm TL), PEM 8191; Sodwana Bay; Id. MJS.

**Otolith shape:** Oblong. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Flattened; **sculpture**, dentate to irregular. **Ventral margin:** Slightly rounded and crenate to irregular. **Posterior margin:** Oblique, bluntly rounded and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, very low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Approximately triangular, not completely filled by colliculum. **Cauda:** Straight and shallow becoming strongly recurved and deeper posteriorly, with narrow tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.1. **Collum:** Absent. **Crista superior:** Well developed above ostium, ridge-like above anterior cauda, well developed after flexion. **Crista inferior:** Poorly developed under ostium, ridge-like under anterior cauda, well developed after flexion. **Dorsal depression:** Oval, above crista. **Ventral depression:** Deep under flexion, with groove in mid-ventral area. **Rostrum:** Broad and pointed. **Antirostrum:** Small and rounded. **Excisura:** Moderately wide, notch shallow, angle varies.

***Plectorhinchus sordidus*, SSF No. 179.9 PLATE 82**

**DISTRIBUTION:** Red Sea to Transkei; Mauritius. Attains 60 cm.

**MATERIAL:** 1/1 (6.06 mm OD, 200 mm TL), PEM 2713; Sodwana Bay; Id. MMS.

**Otolith shape:** Oblong. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded; **sculpture**, irregular to dentate. **Ventral margin:** Slightly rounded and crenate to irregular. **Posterior margin:** Rounded, blunt and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Elongate and oval. **Cauda:** Straight anteriorly with right-angled flexion and slightly recurved tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.7. **Collum:** Absent. **Crista superior:** Moderately well developed above ostium, ridge-like above anterior cauda, well developed after flexion. **Crista inferior:** Poorly developed under ostium, well developed under rest of sulcus. **Dorsal depression:** Oval. **Ventral depression:** Absent, area with uneven ripples. **Rostrum:** Large, broad and rounded. **Antirostrum:** Small and pointed. **Excisura:** Wide, notch shallow, angle acute.

***Pomadasys commersonnii*, SSF No. 179.10 PLATE 82**

**DISTRIBUTION:** Indian Ocean from India round to False Bay but absent from central islands like Seychelles. Attains 80 cm.

**MATERIAL:** 5/95 (4.05-18.8 mm OD, 77-932 mm TL), PEM 2117, 2216, 9614, 0703, 10495; Swartkops estuary and ORI; Id. MJS, RvdE.

**Otolith shape:** Rounded oval. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral concave, juveniles (c. 5 mm OD) flatter. **Lateral surface:** Irregular grooves on larger otoliths. **Dorsal margin:** Rounded and raised; **sculpture**, very irregular. **Ventral margin:** Well rounded and approximately entire. **Posterior margin:** Rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low anterior and posterior colliculi. **Pseudocolliculum:** Absent. **Ostium:** Approximately oval, ventral margin slightly sinuous. **Cauda:** Strongly curved along its length, ends very close to margin in large otoliths. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.3, 1:1.3, 1:1.5, 1:1.3, 1:1. **Collum:** Absent. **Crista superior:** Well developed above ostium, well developed to

ridge-like over anterior cauda, well developed posteriorly. **Crista inferior:** Moderately well developed along whole sulcus. **Dorsal depression:** Oval and shallow above crista. **Ventral depression:** Very shallow and elongate below caudal crista, may be margin groove from caudal tip to ostium. **Rostrum:** Large, broad and sharply rounded or pointed. **Antirostrum:** Absent or minute and sharply rounded. **Excisura:** Moderately wide, notch very shallow if present, angle wide.

***Pomadasys furcatum*, SSF No. 179.11 PLATE 82**

**DISTRIBUTION:** Madagascar to Natal; rare south of Durban. Attains 50 cm.

**MATERIAL:** 3/6 (8.6-10.0 mm OD, 190, 197 mm FL, 6119 not measured), PEM 6117, 2690, 6119; Mbibi and Botla Point; Id. MJS, PCH.

**Otolith shape:** Approximately oval. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral concave. **Lateral surface:** Dorsal hollow joins vertical indentation. **Dorsal margin:** Raised centrally, emarginate posteriorly; **sculpture**, slightly irregular. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Blunt, square and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph with very low anterior and posterior colliculi. **Pseudocolliculum:** Absent. **Ostium:** Oblong to rectangular, ventral edge straight. **Cauda:** Strongly curved, tip slightly recurved and pointed. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:0.9, 1:1, 1:1. **Collum:** Absent. **Crista superior:** Moderately well developed above ostium, narrow ridge along cauda, becoming well developed posteriorly. **Crista inferior:** Moderate to well developed along sulcus. **Dorsal depression:** Elongate and shallow, following cauda. **Ventral depression:** Absent. **Rostrum:** Short, broad and rounded. **Antirostrum:** Minute and sharply rounded. **Excisura:** Moderately wide, notch very shallow, angle wide.

***Pomadasys kaakan*, SSF No. 179.13 PLATE 82**

**DISTRIBUTION:** Indo-Pacific, south to Transkei. Attains 45 cm.

**MATERIAL:** 3/8 (12.88-25.7 mm OD, 243-652 mm TL), PEM 0406, 0597, 11740; Durban; Id. RvdE, GJBR, MJS.

**Otolith shape:** Approximately oval. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral slightly concave. **Lateral surface:** Ventral depressions (c. 13.9 mm OD), becoming honeycombed with growth (c. 25.7 mm OD). **Dorsal margin:** Slightly raised, rounded and angular; **sculpture**, crenate to very irregular. **Ventral margin:** Rounded and crenate to slightly irregular. **Posterior margin:** Broad, bluntly rounded and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low anterior colliculum, posterior very poorly defined and indented. **Pseudocolliculum:** Absent. **Ostium:** Elongate and oval becoming narrow (c. 25 mm OD). **Cauda:** Gently curved (< 13 mm OD) becoming straighter with angled flexion (c. 25 mm OD), narrows slightly posteriorly. **Ostio-caudal differentiation:** Dorso-ventral constrictions. **Ostium/cauda:** 1:1.7, 1:1.2, 1:1.1. **Collum:** Absent. **Crista superior:** Moderately well developed over ostium, ridge-like anterior cauda, well developed posteriorly. **Crista inferior:** Moderately well developed along entire sulcus. **Dorsal depression:** Elongate and shallow, reaches ostium. **Ventral depression:** Absent. **Rostrum:** Short, broad and sharply rounded. **Antirostrum:** Absent. **Excisura:** Moderately wide, notch absent.

***Pomadasys maculatum*, SSF No. 179.15 PLATE 82**

**DISTRIBUTION:** Indo-West Pacific, south to Transkei. Attains 45 cm.

**MATERIAL:** 3/6 (6.2-8.6 mm OD, 103-135 mm SL), PEM 6104, 0615, 9620; Durban and St Lucia estuary; Id. GJBR, RvdE, MJS.



**Otolith shape:** Rounded oval. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral slightly concave. **Lateral surface:** Vertical indentations may be present. **Dorsal margin:** Raised, roundly angled; **sculpture,** slightly irregular. **Ventral margin:** Well rounded and slightly irregular or crenate. **Posterior margin:** Flattened and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Oval, postero-ventral corner bulges posteriorly. **Cauda:** Straight then sharply flexed, tapering and ending close to ventral margin in larger otoliths. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.2, 1:1.5, 1:1.3. **Collum:** Absent. **Crista superior:** Poorly developed and irregular above ostium, narrow, low ridge along straight part of cauda, well developed posteriorly. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Shallow, follows shape of cauda. **Ventral depression:** Absent, very shallow groove close to margin at midpoint. **Rostrum:** Short, broad and rounded. **Antirostrum:** Small and pointed. **Excisura:** Moderately wide, notch shallow, angle acute.

***Pomadasys multimaculatum*, SSF No. 179.16  
PLATE 83**

**DISTRIBUTION:** Known only from Zanzibar to Algoa Bay. Attains 60 cm.

**MATERIAL:** 3/4 (21.5-23.3 mm OD, 537-586 mm TL), PEM 0459, 10084, 7345; Swartkops river mouth, ORI and Kowie; Id. MJS, RvdE.

**Otolith shape:** Approximately oval. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral concave. **Lateral surface:** Vertical depression. **Dorsal margin:** Rounded and slightly raised; **sculpture,** crenate to irregular. **Ventral margin:** Rounded and crenate. **Posterior margin:** Rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Elongate, narrow and oblong. **Cauda:** Curved along its length and deepens posteriorly, tip pointed. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.1, 1:1, 1:1. **Collum:** Absent. **Crista superior:** Well developed above ostium, ridge-like along cauda, well developed posteriorly. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Bilobed depression above crista, may be groove near margin. **Ventral depression:** Absent, area very broad and rounded. **Rostrum:** Short, blunt and rounded. **Antirostrum:** Absent. **Excisura:** Moderate, notch absent.

***Pomadasys olivaceum*, SSF No. 179.17 PLATE 83**

**DISTRIBUTION:** India, Arabia, Madagascar to False Bay. Attains 30 cm.

**MATERIAL:** 6/210 (2.37-10.65 mm OD, 42-228 mm TL), PEM 4675 (RUSI 14930), 4671, 3054, 3724, 4938, 4169; Algoa Bay and Cape south coast; Id. MJS, PCH.

**Otolith shape:** Approximately rounded oval. **Thickness:** Thick. **Form:** - Mesial concave, - Lateral convex. **Dorsal margin:** Rounded; **sculpture,** crenate to irregular. **Ventral margin:** Well rounded and slightly irregular. **Posterior margin:** Rounded and crenate or slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, very low anterior and posterior colliculi. **Pseudocolliculum:** Absent. **Ostium:** Broad and short, approximately oval, postero-ventral corner c. right-angled. **Cauda:** Straight becoming flexed at tip, almost straight in juveniles (<c. 3 mm OD). **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.6, 1:1.1, 1:1.4, 1:2.1, 1:1.4, 1:1.7. **Collum:** Absent. **Crista superior:** Well developed along entire sulcus. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Oval and shallow becoming indistinct in large

otoliths (c. 9 mm OD). **Ventral depression:** Absent, shallow groove near margin. **Rostrum:** Moderate, broad and sharply rounded. **Antirostrum:** Absent or small and pointed. **Excisura:** Moderately wide, notch very shallow, angle wide.

***Pomadasys striatum*, SSF No. 179.18 PLATE 83**

**DISTRIBUTION:** Known from Knysna to Beira; recorded from Red Sea and Gulf of Suez around reefs (but latter localities could be *P. stridens*). Attains 22 cm.

**MATERIAL:** 6/20 (3.65-8.92 mm OD, 47-195 mm TL), PEM 0092, 5194, 6539 (RUSI 28379), 6538, 6544, 0718, [6547 (RUSI 28379)]; Cape south coast; Id. GJBR, MJS, PCH.

**Otolith shape:** Bluntly oblong. **Thickness:** Thick. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Lateral surface:** Vertical depressions across otolith close to ventral margin. **Dorsal margin:** Slightly rounded to flattened; **sculpture,** slightly irregular. **Ventral margin:** Rounded and crenate to entire. **Posterior margin:** Sharply rounded becoming blunt and square, slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low anterior and posterior colliculi. **Pseudocolliculum:** Absent. **Ostium:** Approximately oval, juvs more elongate. **Cauda:** Straight anteriorly, sharply flexed, particularly in large otoliths (c. 8 mm OD). **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1, 1:1.3, 1:1.3, 1:1.5, 1:1.2, 1:1.2. **Collum:** Absent. **Crista superior:** Poorly developed over ostium, well developed along cauda, may be low ridge over anterior cauda. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Groove-like depression along dorsal area and posterior area. May be groove over ostium in anterior dorsal area. **Ventral depression:** Absent, shallow groove close to margin from ostium to cauda. **Rostrum:** Short, broad and rounded. **Antirostrum:** Absent. **Excisura:** Moderate, notch absent.

***Pomadasys stridens*, SSF No. 179.19 PLATE 83**

**DISTRIBUTION:** India, Red Sea to Natal and has penetrated to eastern Mediterranean. Attains c. 20 cm.

**MATERIAL:** 1/1 (3.19 mm OD, 128 mm TL), PEM 15543 (RUSI 42631); Gulf of Eilat; Id. PCH.

**Otolith shape:** Approximately oval. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral approximately flat. **Dorsal margin:** Slightly rounded and slightly raised; **sculpture,** slightly irregular. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Tapered, oblique and sharply rounded, slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low anterior and indented posterior. **Pseudocolliculum:** Absent. **Ostium:** Moderately broad and elongate with lobed postero-ventral corner. **Cauda:** Straight anteriorly, flexed near tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.2. **Collum:** Absent. **Crista superior:** Well developed over ostium and caudal tip, low, narrow ridge over cauda. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Elongate from mid-ostium to caudal tip. **Ventral depression:** Absent, shallow margin groove from ostium to caudal tip, joining depressed posterior area. **Rostrum:** Short, broad and rounded. **Antirostrum:** Minute, sharply rounded. **Excisura:** Moderate, notch very shallow, angle acute.

**SPARIDAE Nelson No 322**

**Family characteristics:** Otoliths initially oval becoming ovate, rhomboidal or fusiform with growth, up to at least 23.8 mm OD. Heterosulcoid with ostial openings (rarely may appear ostio-caudal as indistinctly closed tip may end close to margin). Ostium usually oval, cauda narrow and flexed. Heteromorph, anterior low, posterior colliculum usually indistinct and indented along its length. Crista superior always ridge-like along anterior cauda, crista inferior variable, usually well developed, may be ridge-like.



Dorsal depression always present. Juveniles very difficult to identify before characteristic features develop, particularly as this is a speciose family off southern Africa.

**Key**

- 1a. Ventral margin angled . . . . . 2
- 1b. Ventral margin flat or rounded, bulbous, not angled . . . 3
- 2a. Ostium and rostrum very elongate and broad; dorsal margin sharply raised posteriorly; otolith approximately ovate . . . . . *Polyamblyodon gibbosum* 183.28
- 2b. Ostium and rostrum moderate; dorsal margin flattened; otolith rhomboidal or ovate. . . . .  
. . . . . *Polysteganus undulosus* 183.32
- 3a. Ventral margin of otolith approximately flat . . . . . 4
- 3b. Ventral margin of otolith not flat . . . . . 5
- 4a. Dorsal margin of ostium short and slightly flared; ventral margin of ostium flared ventrally; otolith margins crenate dentate or irregular; cauda with rounded flexion near tip; postero-ventral corner not extended . . . . .  
. . . . . *Acanthopagrus bifasciatus* 183.2
- 4b. Dorsal margin of ostium longer and rounded; ventral margin of ostium approximately horizontal; otolith margins serrate to digitate and irregular; cauda almost straight, slightly flexed at tip; postero-ventral corner of otolith extended . . . . .  
. . . . . *Lithognathus aureti* 183.19
- 5a. Ventral margin of otolith bulbous or well rounded . . . 6
- 5b. Ventral margin other . . . . . 7
- 6a. Ventral margin of otolith very bulbous; dorsal margin becoming raised and flattened; dorsal area relatively wide, dorsal and posterior margins very irregular; cauda with short flexion near tip; ostium ventral wall approximately straight . . . *Pterogymnus lanarius* 183.34
- 6b. Ventral margin of otolith very bulbous; dorsal margin rounded and notched; posterior margin depressed, margins very irregular; cauda flexed, tip elongate, ending near margin; ostium ventral wall approximately straight . . . . *Polysteganus coeruleopunctatus* 183.29
- 6c. Ventral margin of otolith moderately bulbous or well-rounded; dorsal margin slightly rounded or flattened; posterior margin flat and square; cauda sharply flexed, tip short, extends closer to margin with growth; ostium ventral wall approximately straight . . . . . *Porcostoma dentata* 183.33
- 6d. Ventral margin of otolith moderately bulbous or well-rounded; dorsal margin rounded becoming raised and flattened; posterior margin oblique and angled; cauda straight and long then flexed with short tip; ostium ventral wall approximately straight . . . . .  
. . . . . *Pagellus bellottii natalensis* 183.25
- 6e. Ventral margin of otolith moderately bulbous; dorsal margin rounded; posterior margin sharply rounded; all margins crenate; cauda relatively short and gently flexed along its length; ostium ventral wall approximately straight . . . *Chrysoblephus cristiceps* 183.9
- 6f. Ventral margin of otolith well-rounded; dorsal margin slightly rounded or flattened; posterior margin oblique and angled; cauda slightly angled ventrally with short flexion; ventral wall of ostium sinuous . . . . .  
. . . . . *Chrysoblephus puniceus* 183.13
- 7a. Otolith elongate; ventral margin of otolith slightly rounded to flattened . . . . . 8
- 7b. Otolith not elongate; ventral margin of otolith rounded . . . . . 9

- 8a. Otolith moderately narrow; dorsal margin of otolith flattened and angular becoming slightly rounded; cauda moderately elongate, almost straight and slightly flexed at tip . . . . . *Argyrozona argyrozona* 183.5
- 8b. Otolith moderately narrow; dorsal margin of otolith flat; cauda relatively short, gently flexed along its length . . . . . *Pachymetopon blochii* 183.23
- 8c. Otolith moderately narrow; dorsal margin of otolith slightly raised in centre; cauda straight, angled slightly ventrally, flexed, tip short . . . . .  
. . . . . *Lithognathus mormyrus* 183.21
- 8d. Otolith moderately narrow; dorsal margin of otolith becomes flattened; cauda flexed, tip ends near ventral margin, tip parallel with oblique, flat posterior margin; postero-dorsal and postero-ventral corners of otolith angled, latter protrudes and pointed . . . . . *Sarpa salpa* 183.39
- 8e. Otolith moderately narrow; dorsal margin emarginate with lip on its lateral surface; cauda slightly sinuous, flexed and flared . . . *Diplodus sargus capensis* 183.17
- 8f. Otolith moderately narrow; dorsal margin becomes emarginate and raised at posterior, dorsal area reduces with growth and irregular; cauda very deep and flexed, tip extends to postero-ventral corner . . . . .  
. . . . . *Sparodon durbanensis* 183.40
- 8g. Otolith moderately broad; dorsal margin rounded becoming flattened or emarginate; posterior margin flat to emarginate; cauda becomes slightly sinuous and strongly flexed near tip which is not distinctly closed . . . . . *Petrus rupestris* 183.26
- 9a. Crista inferior forms a broad ridge under cauda (in juveniles crista only well-developed) . . . . . 10
- 9b. Crista inferior under cauda well-developed, not a broad ridge . . . . . 11
- 10a. Dorsal margin of otolith slightly rounded to flat; posterior margin flat, oblique and tapered; postero-dorsal corner angled; ostium approximately oval, not wide . . . . . *Pachymetopon aeneum* 183.22
- 10b. Dorsal margin of otolith slightly rounded, may be notched, margin becomes very irregular; posterior margin sharply rounded to pointed, may become oblique and irregular; postero-dorsal corner not angled; ostium large and oval . . *Pachymetopon grande* 183.24
- 10c. Dorsal margin flattened; posterior margin oblique and bluntly pointed; postero-dorsal corner angled; ostium oval and broad . . . *Polyamblyodon germanum* 183.27
- 11a. Crista inferior forms a narrow (not broad), low ridge under ostium . . . . . 12
- 11b. Crista inferior poorly or well-developed under ostium . . . . . 13
- 12a. Cauda angled ventrally, gently curved and flexed near tip . . . . . *Chrysoblephus lophus* 183.12
- 12b. Cauda straight, straight and elongate, flexed near tip . . . . . *Gymnocrotaphus curvidens* 183.18
- 13a. Ostium relatively narrow, its margins not widely flared . . . . . 14
- 13b. Ostium with distinctly flared dorsal or ventral margins, or both flared . . . . . 15
- 14a. Ostium with dorsal and ventral margins of ostium approximately parallel; cauda elongate, gently flexed; crista superior forms a narrow ridge over anterior cauda; dorsal depression oval and relatively elongate: *Argyrops filamentosus* 183.3; *Argyrops spinifer* 183.4

- 14b. Ostium oval, its dorsal margin flared dorsally; cauda short, wide and flexed near tip; crista superior forms short, broad ridge over anterior cauda; dorsal depression short and oval . . . *Boopsoida inornata* 183.6
- 14c. Ostium relatively narrow; cauda slightly angled ventrally and strongly flexed; crista superior forms narrow ridge over anterior cauda; dorsal depression oval and elongate . . . *Chrysoblephus laticeps* 183.11
- 14d. Ostium oval becoming elongate with very short dorsal wall; cauda slightly sinuous and elongate, strongly flexed with short tip; crista superior forms narrow ridge over cauda to flexion; dorsal depression large, deep and oval . . . *Cheimerius nufar* 183.7
- 14e. Ostium relatively narrow, its ventral margin sinuous; cauda elongate, flexed at tip; crista superior narrow ridge along anterior cauda; dorsal depression elongate and moderately deep . . . *Lithognathus lithognathus* 183.20
- 14f. Ostium moderately narrow, dorsal margin of ostium may be slightly flared; cauda slightly flexed, tapered at short tip; crista superior ridge-like over anterior cauda; dorsal depression moderately deep and elongate . . . *Spondyliosoma emarginatum* 183.41
- 15a. Dorsal margin of ostium flared, ventral margin approximately horizontal . . . 16
- 15b. Dorsal and ventral margins of ostium flared . . . 17
- 16a. Ostium broad and oval; cauda straight initially, dorsal wall more flexed than ventral, tapers to tip; dorsal margin slightly rounded to flattened . . . *Crenidens crenidens* 183.14
- 16b. Ostium approximately oval; cauda angled slightly and flexed near rounded tip; dorsal margin becomes flattened with growth . . . *Diplodus cervinus hottentotus* 183.16
- 16c. Ostium oval, colliculum raised on dorsal margin; cauda distinctly angled ventrally, short and deep, curved along its length; dorsal margin rounded . . . *Chrysoblephus gibbiceps* 183.10
- 16d. Ostium moderately elongate, oval and narrow, its dorsal margin slightly flared; cauda short, more strongly flexed dorsally than ventrally; dorsal margin of otolith slightly flattened, postero-dorsal corner of otolith angled with posterior margin oblique . . . *Rhabdosargus globiceps* 183.35
- 17a. Dorsal and posterior margins of otolith approximately flat; postero-dorsal corner angular . . . 18
- 17b. Dorsal and posterior margins of otoliths rounded, not angled and oblique; postero-ventral corner rounded . . . 19
- 18a. Cauda slightly angled ventrally, elongate, flexed near tip, ends near ventral margin; postero-ventral corner rounded or angled, not spurred . . . *Rhabdosargus thorpei* 183.38
- 18b. Cauda short, slightly angled ventrally with short flexion, slightly pointed at tip; postero-ventral corner angled . . . *Rhabdosargus holubi* 183.36
- 18c. Cauda horizontal, sharply flexed and deep; postero-ventral corner of otolith sharply angled, becomes spurred . . . *Rhabdosargus sarba* 183.37
- 19a. Cauda slightly flexed near tip which ends far from margin; dorsal margin angular becoming rounded . . . *Acanthopagrus berda* 183.1
- 19b. Cauda with slightly sinuous ventral margin, deep with growth, flexion rounded, tip elongate; dorsal margin of otolith rounded becoming well rounded . . . *Cymatoceps nasutus* 183.15
- 19c. Cauda slightly sinuous, flexed and deeper near tip; dorsal margin rounded and posterior margin of otolith oblique, postero-ventral corner extended . . . *Polysteganus praeorbitalis* 183.31
- 19d. Cauda deep, strongly flexed, tip undercuts ventral area and ends near margin; dorsal margin raised and rounded . . . *Chrysoblephus anglicus* 183.8

#### *Acanthopagrus berda*, SSF No. 183.1 PLATE 83

**DISTRIBUTION:** Abundant and widespread in tropical Indo-Pacific and plentiful in Mozambique, Natal and Transkei, occasionally to Swartvlei, west of Knysna. Attains 75 cm in this area.

**MATERIAL:** 4/47 (3.85-13.4 mm OD, 154-404 mm SL), PEM 0843, 8731, 0717, 7951; Swartkops and ORI; Id. GJBR, MJS.

**Otolith shape:** Rhomboidal (<7 mm OD), becoming oval to oblong with growth. **Thickness:** Moderate. **Form:** - **Mesial** convex, - **Lateral** concave. **Dorsal margin:** Angular and raised in juveniles becoming rounded; **sculpture**, dentate to irregular. **Ventral margin:** Rounded becoming slightly rounded and crenate or slightly irregular. **Posterior margin:** Sharply rounded and dentate to slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, raised anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Oval, flaring dorsally and slightly ventrally. **Cauda:** Approximately straight, slightly flexed, stronger on dorsal margin of cauda, tip ends far from margin. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.4, 1:1.2, 1:1.1, 1:1.4. **Collum:** Absent, may be step to cauda in small otoliths. **Crista superior:** Well developed above ostium and after flexion, ridge-like over anterior cauda. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Oval, extending from ostium to flexion, may be a ridge above dorsal depression. Dorsal area relatively reduced with growth. **Ventral depression:** Absent. **Rostrum:** Broad, sharply rounded to rounded. **Antirostrum:** Minute or very small and pointed. **Excisura:** Moderately wide, notch shallow, angle variable.

#### *Acanthopagrus bifasciatus*, SSF No. 183.2 PLATE 83

**DISTRIBUTION:** Western Indian Ocean, from Red Sea and Persian Gulf to Durban, Natal. Attains 50 cm.

**MATERIAL:** 3/5 (5.18-8.3 mm OD, 155-300 mm TL), 1172H, PEM 2827, 7432; Banga Nek, Kosi and Red Sea; Id. MJS, TH.

**Otolith shape:** Oblong to fusiform. **Thickness:** Moderate. **Form:** - **Mesial** convex, - **Lateral** concave. **Dorsal margin:** Slightly rounded; **sculpture**, crenate to irregular. **Ventral margin:** Flattened or slightly rounded and crenate or irregular. **Posterior margin:** Obliquely angled, sharply rounded and dentate or irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Flared, approximately oval. **Cauda:** Moderately deep, straight with rounded flexion near tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.1, 1:1.1, (2827 lost). **Collum:** Absent, slight step to cauda. **Crista superior:** Well developed over anterior ostium and after flexion, ridge-like over anterior cauda. **Crista inferior:** Well developed along sulcus. **Dorsal depression:** Elongate from ostium to cauda. **Ventral depression:** Absent. **Rostrum:** Moderate, broad and blunt. **Antirostrum:** Absent to minute and sharply rounded. **Excisura:** Moderately wide, notch very shallow, angle wide.

#### *Argyrops filamentosus*, SSF No. 183.3 PLATE 84

**DISTRIBUTION:** Red Sea and western Indian Ocean, reaches Natal. Attains 70 cm.



**MATERIAL:** 3/4 (7.72-13.0 mm OD, 219-392 mm TL), PEM 14860 (RUSI 35591), 8645, 5999; Kosi Bay and Ramsgate; Id. MJS, PCH.

**Otolith shape:** Approximately ovate to oval. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral juveniles approximately flat, becoming concave. **Lateral surface:** No distinguishing features, but may have honey-comb like depressions in large otoliths (c. 13 mm OD). **Dorsal margin:** Raised and rounded; **sculpture,** lobed to dentate and irregular. **Ventral margin:** Rounded, dentate may become digitate and irregular. **Posterior margin:** Angled, flattened and sharply rounded, sculpture dentate to irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior raised, posterior colliculum indented. **Pseudocolliculum:** Absent. **Ostium:** Oval becoming elongate, ventral wall approximately horizontal in large otoliths. **Cauda:** Approximately straight with flexion near tip (<10 mm OD), becoming gently flexed (c. 13 mm OD). **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.3, 1:1.5, 1:1.3. **Collum:** Absent. **Crista superior:** Ridge-like from ostium to cauda, very poorly developed at tip. **Crista inferior:** Well developed along sulcus. **Dorsal depression:** Oval and elongate. **Ventral depression:** Absent, may be shallow groove near margin. **Rostrum:** Broad, pointed (<10 mm OD) becoming sharply rounded. **Antirostrum:** Small and pointed. **Excisura:** Moderate, notch shallow or moderate, angle acute or wide.

#### *Argyrops spinifer*, SSF No. 183.4 PLATE 84

**DISTRIBUTION:** Widespread in tropical Indo-West Pacific, common off Natal, occasionally reaches Knysna, nowhere plentiful. Attains 70 cm.

**MATERIAL:** 5/7 (11.8-16.2 mm OD, 322-540 mm FL), PEM 6776, 5674, 6777, 6296, 5990; Banga Nek, Port Durnford and Durban; Id. MJS.

**Otolith shape:** Approximately oblong to ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Raised and angular; **sculpture,** irregular. **Ventral margin:** Rounded and dentate, crenate or irregular. **Posterior margin:** Oblique, sharply rounded and crenate to irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, slightly raised anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Approximately oval. **Cauda:** Gently angled flexion, tip poorly defined, may have shallow canal to margin. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.1, 1:1.1, 1:1.1, 1:1.4, 1:1.1. **Collum:** Absent. **Crista superior:** Well developed over anterior ostium and after flexion, ridge-like elsewhere but poorly developed at tip. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Oval. **Ventral depression:** Absent, groove may be present half way down ventral area. **Rostrum:** Moderate, broad and sharply rounded. **Antirostrum:** Small and pointed. **Excisura:** Moderately wide, notch shallow, angle acute.

#### *Argyrozona argyrozona*, SSF No. 183.5 PLATE 84

**DISTRIBUTION:** Found only from Table Bay to Natal. Attains c. 90 cm.

**MATERIAL:** 9/111 (4.9-20.8 mm OD, 104-612 mm TL), PEM 4894, 4900, 3063, 6792, 6793, 10776, 6794, 6922, 5737; Cape south coast; Id. MJS.

**Otolith shape:** Rhomboidal becoming approximately oblong to fusiform. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral moderately concave. **Dorsal margin:** Raised, flattened and angular becoming slightly rounded; **sculpture,** crenate becoming lobed and irregular. **Ventral margin:** Rounded becoming flattened; **sculpture,** crenate and irregular to serrate with growth. **Posterior margin:** Oblique becoming sharply rounded and crenate, or irregular. **Sulcus acusticus:** Ostial, heterosulcoid.

**Colliculum:** Heteromorph with large anterior raised colliculum, posterior low and indistinct. **Pseudocolliculum:** Absent. **Ostium:** Oval, becomes elongate with growth, dorsal wall and antirostrum reduced with growth. **Cauda:** Straight, moderately long and slightly flexed near tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.2, 1:1.1, 1:1.2, 1:1.3, 1:1.4, 1:1.5, 1:1.3, 1:1.4, 1:1.1. **Collum:** Absent. **Crista superior:** Poorly developed over ostium, in large otoliths (>19 mm OD) crista absent, ridge-like above anterior cauda, well developed after flexion. **Crista inferior:** Poorly developed below ostium, well developed below cauda. **Dorsal depression:** Elongate, oval and shallow from ostium to above cauda, a second, anterior depression over ostium in large otoliths. **Ventral depression:** Absent. **Rostrum:** Broad and sharply rounded becoming elongate with growth. **Antirostrum:** Small and sharply rounded or absent. **Excisura:** Moderately wide becoming wide, notch shallow, angle acute.

#### *Boopsoides inornata*, SSF No. 183.6 PLATE 84

**DISTRIBUTION:** Known only from the Cape to Natal. Attains 30 cm.

**MATERIAL:** 6/40 (3.1-10.2 mm OD, 59-266 mm TL), PEM 10332, 7522, 7521, 1880 (RUSI 8973), 6816, 9585; Cape south coast; Id. MJS, PCH.

**Otolith shape:** Approximately rhomboidal becoming oval with growth. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Rounded; **sculpture,** lobed, crenate and irregular. **Ventral margin:** Rounded and crenate to irregular. **Posterior margin:** Sharply rounded and crenate or irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Oval. **Cauda:** Approximately straight and shallow, flexed near tip, tip very poorly defined and narrows slightly. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.2, 1:1.2, 1:1, 1:1, 1:1, 9585 lost. **Collum:** Absent. **Crista superior:** Well developed above ostium and after flexion, ridge-like over anterior cauda, poorly developed at tip. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Oval. **Ventral depression:** Absent, narrow, shallow groove may be present near margin on large otoliths (c. 8 mm OD). **Rostrum:** Broad and sharply rounded. **Antirostrum:** Minute and pointed or absent. **Excisura:** Moderately wide, notch shallow, angle wide.

#### *Cheimerius nufar*, SSF No. 183.7 PLATE 84

**DISTRIBUTION:** Widespread in tropical Indo-Pacific. Extends to the Cape. Attains 75 cm.

**MATERIAL:** 6/210 (4.8-17.8 mm OD, 104-565 mm FL), PEM 4891, 6767, 1557, 1860, 5819, 5772, [6764 (RUSI 28380)]; Cape south coast; Id. MJS.

**Otolith shape:** Rhomboidal becoming ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded and flattened or raised; **sculpture,** crenate to irregular. **Ventral margin:** Angular (<6.8 mm OD), becoming rounded; crenate to irregular. **Posterior margin:** Sharply rounded or oblique and angular, crenate to irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Approximately oval, becoming elongate, dorsal wall very short. **Cauda:** Slightly sinuate, strongly flexed near tip, walls steep may undercut ventral area. Shallow groove from caudal tip to margin may be present. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.4, 1:1, 1:1.2, 1:1.3, 1:1.1, 1:1.3. **Collum:** Absent. **Crista superior:** Poorly developed over ostium, ridge-like above cauda, well developed after flexion. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Deep, oval becoming approxi-



mately rectangular (>17 mm OD). **Ventral depression:** Absent, may be shallow groove near margin. **Rostrum:** Large, broad and sharply rounded. **Antirostrum:** Small and rounded or absent. **Excisura:** Moderately wide, notch shallow, angle acute.

#### *Chrysoblephus anglicus*, SSF No. 183.8 PLATE 85

**DISTRIBUTION:** Found only on east coast, reaches Algoa Bay. Attains 100 cm.

**MATERIAL:** 6/50 (9.1-13.1 mm OD, 307-647 mm TL), PEM 8650, 5675, 8657, 8669, 7763, 7759; ORI, Transkei, Zululand; Id. MJS.

**Otolith shape:** Approximately rhomboidal. **Thickness:** Moderate. **Form:** - **Mesial** very convex, - **Lateral** concave. **Dorsal margin:** Raised and rounded; **sculpture**, crenate to irregular. **Ventral margin:** Rounded, angled posteriorly, crenate to irregular. **Posterior margin:** Sharply rounded, oblique and crenate to irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior colliculum raised, posterior very indistinct. **Pseudocolliculum:** Absent. **Ostium:** Flares widely, ventral wall slightly sinuate, approximately rounded to oval. **Cauda:** Deep, strongly flexed and deepening posteriorly, undercuts ventral area, tip ends close to margin. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.3, 1:1.1, 1:1.3, 1:1.2, 1:1.2, 1:1.2. **Collum:** Absent. **Crista superior:** Well developed above anterior ostium, ridge-like over anterior cauda, well developed after flexion. **Crista inferior:** Well developed along sulcus. **Dorsal depression:** Oval and moderately deep. **Ventral depression:** Absent, may be short groove at margin. May be pit under caudal tip, ventral area may be irregular. **Rostrum:** Large, very broad and rounded to sharply rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Moderately wide, notch very shallow, angle wide.

#### *Chrysoblephus cristiceps*, SSF No. 183.9 PLATE 85

**DISTRIBUTION:** Found only from the Cape to Natal, most abundant on Cape south coast. Attains 75 cm.

**MATERIAL:** 8/30 (5.0-19.72 mm OD, 114-c.600 mm TL), PEM 5481, 5483, 7028, 7029, 0014, 5846, 3428, 0152; Cape south coast; Id. GJBR, MJS, CDB, PCH.

**Otolith shape:** Approximately rhomboidal. **Thickness:** Moderate. **Form:** - **Mesial** very convex, - **Lateral** concave. **Dorsal margin:** Rounded; **sculpture**, dentate or serrate. **Ventral margin:** Rounded and crenate to dentate. **Posterior margin:** Sharply rounded, dentate or irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, distinct anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Elongate and oval. **Cauda:** Gently flexed along its length, steep ventral wall. **Ostio-caudal differentiation:** Dorso-ventrally constricted, mainly ventrally. **Ostium/cauda:** 1:1.1, 1:1.5, 1:1.2, 1:1.1, 1:1.3, 1:1.1, 1:1.3, 1:1.2. **Collum:** Absent. **Crista superior:** Well developed above ostium, may join groove in antirostrum, ridge-like above cauda, well developed after flexion. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Oval, shallow, may be an anterior groove into ostium through crista superior. **Ventral depression:** Absent. **Rostrum:** Large, broad and sharply rounded, becoming rounded (c. 12.2 mm OD). **Antirostrum:** Small and pointed. **Excisura:** Moderately wide, notch shallow, angle acute.

#### *Chrysoblephus gibbiceps*, SSF No. 183.10 PLATE 85

**DISTRIBUTION:** Found only from the Cape to Natal. Attains 75 cm.

**MATERIAL:** 5/32 (8.6-15.22 mm OD, 257-544 mm TL, 0016 not measured), PEM 10794, 15095, 6803, 6830, 0016; Cape south coast; Id. GJBR, MJS, CDB.

**Otolith shape:** Variable, approximately oval, rhomboidal to ovate. **Thickness:** Moderate. **Form:** - **Mesial** strongly convex, - **Lateral** strongly concave. **Dorsal margin:** Rounded; **sculpture**, serrate to irregular. **Ventral margin:** Rounded and crenate to irregular. **Posterior margin:** Rounded or becoming more pointed, crenate to irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, with raised anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Approximately oval, colliculum raised on dorsal margin of rostrum. **Cauda:** Distinctly angled ventrally, short and gently flexed, may be groove from tip to margin. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.1, 1:1.2, 1:1.2, 1:1.2, 1:1.5. **Collum:** Absent. **Crista superior:** Well developed above ostium and over flexion, ridge-like above anterior cauda, poorly developed at tip. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Oval and shallow from ostium to flexion, dorsal area wide. **Ventral depression:** Absent, groove from margin meets caudal tip. **Rostrum:** Large, broad and rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Moderately wide, notch shallow, angle varies - acute or wide.

#### *Chrysoblephus laticeps*, SSF No. 183.11 PLATE 85

**DISTRIBUTION:** Occurs from the Cape (to Mauritius?). Attains at least 50 cm.

**MATERIAL:** 5/35 (2.65-13.5 mm OD, 76-436 mm TL), PEM 1949, 7032, 10887, 10882, 6828; Cape south coast; Id. MJS, CDB.

**Otolith shape:** Approximately ovate. **Thickness:** Moderate. **Form:** - **Mesial** convex, - **Lateral** concave. **Dorsal margin:** Slightly rounded to flattened; **sculpture**, crenate to irregular. **Ventral margin:** Slightly rounded and crenate to irregular. **Posterior margin:** Oblique, flattened and angular, crenate to irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph with raised anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Approximately oval. **Cauda:** Straight then strongly flexed in posterior, may be groove from caudal tip to margin. Juveniles (c. 2.7 mm OD) have almost straight cauda, slightly flexed at tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.4, 1:1.2, 1:1.5, 1:1.4, 1:1.1. **Collum:** Absent. **Crista superior:** Well developed over ostium, ridge-like over anterior cauda, well developed after flexion. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Oval and elongate from posterior ostium to caudal flexion. **Ventral depression:** Absent, a shallow groove may be present close to margin. **Rostrum:** Short, broad and sharply rounded. **Antirostrum:** Absent or small and sharply rounded. **Excisura:** Moderate, notch absent or shallow, angle acute.

#### *Chrysoblephus lophus*, SSF No. 183.12 PLATE 85

**DISTRIBUTION:** Known only from Natal. Attains 50 cm.

**MATERIAL:** 1/1 (12.0 mm OD, 435 mm TL), PEM 6278; Port Durnford; Id. MJS.

**Otolith shape:** Approximately oval. **Thickness:** Moderately thick. **Form:** - **Mesial** convex, - **Lateral** concave. **Dorsal margin:** Slightly rounded and notched; **sculpture**, lobed to irregular. **Ventral margin:** Rounded and crenate to irregular. **Posterior margin:** Angled, oblique and crenate to irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior, low, posterior colliculum very indistinct. **Pseudocolliculum:** Absent. **Ostium:** Large, oval and flared. **Cauda:** Angled ventrally, gently curved, flexed near tip, walls steep. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.1. **Collum:** Absent. **Crista superior:** Well developed above ostium, ridge-like (broken) above cauda, well developed near tip. **Crista inferior:** Moderately well developed below ostium, very well developed or low ridge below cauda. **Dorsal depression:** Very shallow and oval in shape. **Ventral depression:** Shallow and



narrow under crista, ventral groove near margin. **Rostrum:** Large, broad and sharply rounded. **Antirostrum:** Short and rounded. **Excisura:** Moderately wide, notch absent or very shallow, angle wide.

#### *Chrysoblephus puniceus*, SSF No. 183.13 PLATE 86

**DISTRIBUTION:** Common off Natal and southern Mozambique and Madagascar; occasionally to East London and Knysna. Attains 85 cm.

**MATERIAL:** 6/149 (8.1-14.9 mm OD, 207-516 mm TL), PEM 7527 (RUSI 21231), 8469 (RUSI 37503), 7755, 8649, 7753, 8481, [8466, 8467 (RUSI 37503), 8798 (RUSI 37438)]; Natal, Sodwana Bay, Algoa Bay; Id. MJS, PCH.

**Otolith shape:** Approximately oval to rhomboidal. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded or flattened; **sculpture**, dentate and irregular. **Ventral margin:** Well rounded and irregular, dentate or crenate. **Posterior margin:** Oblique, angled and sharply rounded, dentate or irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph with low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Approximately oval, flared dorsally, sinuous ventral wall. **Cauda:** Slightly angled ventrally with short flexion. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.1, 1:1, 1:1.1, 1:1.3, 1:1.1, 1:1. **Collum:** Absent. **Crista superior:** Ridge-like along sulcus. **Crista inferior:** Well developed along sulcus. **Dorsal depression:** Elongate from ostium along cauda to ventral margin. **Ventral depression:** Absent, may be very shallow groove near margin. **Rostrum:** Large, broad and sharply rounded. **Antirostrum:** Absent or small and pointed. **Excisura:** Moderately wide, notch shallow and angle acute, if present.

#### *Crenidens crenidens*, SSF No. 183.14 PLATE 86

**DISTRIBUTION:** Known from the Red Sea and Persian Gulf to Durban, rarely to East London. Attains 30 cm.

**MATERIAL:** 6/10 (4.15-6.56 mm OD, 101-180 mm TL), PEM 2053, 2050, 2049, 2047, 2051, 2048, [15557, 15574 & 15731 (all RUSI 42685)]; ORI; Id. RvdE.

**Otolith shape:** Approximately oval to ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral slightly concave or flat. **Dorsal margin:** Slightly rounded to flattened; **sculpture**, lobed and slightly irregular. **Ventral margin:** Rounded and slightly irregular or entire. **Posterior margin:** Oblique, sharply rounded or blunt and slightly crenate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph with low anterior and posterior colliculi. **Pseudocolliculum:** Absent. **Ostium:** Oval, moderately broad, flared dorsally. **Cauda:** Initially straight, dorsal wall more strongly flexed than ventral, narrows towards poorly defined tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1, 1:1, 1:1.1, 1:1, 1:1.3, 1:1.1. **Collum:** Absent, slight step to cauda. **Crista superior:** Well developed over entire sulcus, but ridge-like over anterior cauda. **Crista inferior:** Poorly developed along sulcus but absent at tip. **Dorsal depression:** Oval, moderately deep. **Ventral depression:** Absent, very shallow groove from caudal tip to ostium. **Rostrum:** Broad and rounded. **Antirostrum:** Absent or small and sharply rounded. **Excisura:** Moderately wide, notch very shallow, angle acute if present.

#### *Cymatoceps nasutus*, SSF No. 183.15 PLATE 86

**DISTRIBUTION:** From Cape to Natal. Attains c. 130 cm, 45 kg. **MATERIAL:** 6/35 (3.6-21.0 mm OD, 96-1740 mm FL = 32.4kg), PEM 6808, 15168, 15263, 6806, 6805, 1970; southern Cape and Transkei; Id. GJBR, MJS, CDB.

**Otolith shape:** Rhomboidal becoming oval to oval-ovate. **Thickness:** Moderately thick. **Form:** - Mesial strongly convex, - Lateral strongly concave. **Lateral surface:** May have ventral lip at

margin in large otoliths (>10 mm OD). **Dorsal margin:** Rounded becoming well rounded; **sculpture**, dentate, crenate or irregular. **Ventral margin:** Rounded and crenate to irregular. **Posterior margin:** Sharply rounded and crenate to irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Oval, flares dorsally and ventrally, dorsal wall slopes in large otoliths (>10 mm OD). **Cauda:** Slightly sinuous ventral margin, straight with flexion near tip in juvs, deepens posteriorly, cauda deeper with growth. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1, 1:1.3, 1:1.3, 1:0.9, 1:1, 1:0.8. **Collum:** Absent. **Crista superior:** Well developed above ostium and after flexion, ridge-like over anterior cauda. **Crista inferior:** Well developed under entire sulcus. **Dorsal depression:** Elongate and shallow from ostium to flexion. **Ventral depression:** Absent, may be a groove at the margin in large otoliths. **Rostrum:** Large, broad and sharply rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Moderate becoming wide, notch shallow, angle acute if present.

#### *Diplodus cervinus hottentotus*, SSF No. 183.16 PLATE 86

**DISTRIBUTION:** From the Cape to Sodwana Bay. Attains 60cm.

**MATERIAL:** 8/49 (2.8-12.36 mm OD, 59-c. 431 mm TL), PEM 5300, 2616 (RUSI 12511), 5553, 5560, 6016, 1204, 7430, 0507; southern Cape and Kosi Bay; Id. GJBR, MJS, PCH.

**Otolith shape:** Approximately ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Lateral surface:** Antero-ventral lip present in otoliths >10 mm, dorsal margin grooved and thickened. **Dorsal margin:** Slightly rounded (<4 mm OD) becoming flattened (>4 mm OD); **sculpture**, crenate to irregular. **Ventral margin:** Rounded or slightly rounded and crenate to irregular. **Posterior margin:** Sharply rounded or oblique and crenate or irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior colliculum very low, posterior very indistinct. **Pseudocolliculum:** Absent. **Ostium:** Approximately oval, flares dorsally. **Cauda:** Angled slightly ventrally, gently flexed near tip, deepening posteriorly, undercutting ventral area, tip rounded. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1, 1:1, 1:1.1, 1:1, 1:1, 1:0.9, 1:1, 1:1.1. **Collum:** Absent, step up to cauda in largest otoliths (>10 mm OD). **Crista superior:** Well developed above ostium and after flexion, ridge-like along anterior cauda. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Oval and deep from ostium to flexion. **Ventral depression:** Absent, margin depressed especially near caudal tip. **Rostrum:** Large, broad and sharply rounded. **Antirostrum:** Small and pointed or sharply rounded. **Excisura:** Moderately wide, notch shallow, angle acute.

#### *Diplodus sargus capensis*, SSF No. 183.17 PLATE 86

**DISTRIBUTION:** From Angola to Mozambique and southern Madagascar. Attains 45cm.

**MATERIAL:** 7/95 (1.52-8.7 mm OD, 33-331 mm TL), PEM 1420, 1202, 9606, 3859 (RUSI 12032), 8701, 6200, 6205, [6570 (RUSI 37500)]; Natal and southern Cape; Id. RvdE, PCH, HMK, MJS.

**Otolith shape:** Ovate becoming oblong. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Lateral surface:** Characteristic and pronounced dorsal lip near emarginate area in otoliths >3.9 mm. **Dorsal margin:** Slightly rounded (c. 1.5 mm OD), becoming distinctly emarginate (c. 4 mm OD); **sculpture**, entire or slightly irregular. **Ventral margin:** Rounded and slightly crenate or irregular. **Posterior margin:** Rounded (c. 1.5 mm OD) becoming flattened, oblique, sharply rounded and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph with low anterior, indistinct posterior colliculum.



**Pseudocolliculum:** Absent. **Ostium:** Approximately oval, ventral wall may become bulbous (c. 8 mm OD). **Cauda:** Slightly sinuous, flexed and flared, tip poorly defined. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.1, 1:0.9, 1:0.9, 1:1.2, 1:1, 1:1, 1:0.9. **Collum:** Absent. **Crista superior:** Well developed over ostium and after flexion, ridge-like over cauda. **Crista inferior:** Well developed becoming ridge-like under ostium in large otoliths, well developed under cauda. **Dorsal depression:** Elongate from ostium to flexion, dorsal area reduced. **Ventral depression:** Absent, margin depressed may be distinct below ostium. **Rostrum:** Broad and blunt or sharply rounded. **Antirostrum:** Absent or small and pointed. **Excisura:** Moderately wide, notch absent or moderate, angle varies.

#### *Gymnocrotaphus curvidens*, SSF No. 183.18 PLATE 87

**DISTRIBUTION:** From Cape to Durban, attains 50 cm.

**MATERIAL:** 8/17 (2.4-10.62 mm OD, 54-379 mm TL), PEM 7714, 10337, 0004, 11327, 11346, 7026, 14814, 5813; Algoa Bay and environs; Id. MJS, GJBR.

**Otolith shape:** Approximately oval to ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded or approximately flat; **sculpture,** crenate to slightly irregular. **Ventral margin:** Rounded and crenate to irregular. **Posterior margin:** Oblique, flattened, sharply rounded and crenate or irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph with low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Oval. **Cauda:** Straight, flexed near tip, deepens posteriorly. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:0.9, 1:1, 1:1.5, 1:1.4, 1:1.4, 1:1.6, 1:1.4, 7026 lost. **Collum:** Absent. **Crista superior:** Well developed above ostium and after flexion, broad ridge above anterior cauda. **Crista inferior:** Well developed along entire sulcus, may be low ridge under ostium. **Dorsal depression:** Oval, moderately deep, more elongate with growth. **Ventral depression:** May be shallow depression under ostium, may be shallow groove near margin. **Rostrum:** Broad and sharply rounded. **Antirostrum:** Absent or minute and rounded. **Excisura:** Moderately wide, notch absent or shallow, angle acute.

#### *Lithognathus aureti*, SSF No. 183.19 PLATE 87

**DISTRIBUTION:** From Cape Town to Angola, common off Namibia. Attains c. 100 cm.

**MATERIAL:** 6/30 (9.72-11.94 mm OD, 375-550 mm TL), PEM 1804, 1810, 1808, 1802, 1800, 1793; Namibia; Id. GJBR.

**Otolith shape:** Oblong to ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Lateral surface:** Ventral margin may have lip (c. 11.9 mm OD). **Dorsal margin:** Rounded; **sculpture,** serrate to irregular. **Ventral margin:** Flattened or slightly rounded and crenate to irregular. **Posterior margin:** Oblique, flattened and sharply rounded or pointed with postero-ventral corner extended, serrate, digitate or irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Oval, ventral margin poorly defined. **Cauda:** Straight and elongate, flexed near tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.1, 1:1.1, 1:1, 1:1.2, 1:1.3, 1:1.3. **Collum:** Absent. **Crista superior:** Moderately well developed over ostium, ridge-like over cauda, well developed after flexion. **Crista inferior:** Poorly developed under ostium and caudal tip, well developed under cauda. **Dorsal depression:** Oval and deep. **Ventral depression:** Absent, may be groove near margin. **Rostrum:** Very short, broad and sharply rounded. **Antirostrum:** Minute and pointed or rounded. **Excisura:** Moderate, notch very shallow, angle acute.

#### *Lithognathus lithognathus*, SSF No. 183.20 PLATE 87

**DISTRIBUTION:** From Orange River mouth to Natal. Attains 200 cm.

**MATERIAL:** 7/25 (5.48-14.0 mm OD, 150-785 mm FL), PEM 10449, 2573, 1323, 1219, 1342, 1226, 5723; southern Cape coast; Id. MJS, HMK.

**Otolith shape:** Oval to ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Rounded; **sculpture,** crenate to irregular. **Ventral margin:** Rounded and crenate or irregular. **Posterior margin:** Sharply rounded and crenate or very irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Oval, ventral margin sinuous. **Cauda:** Straight, flexed posteriorly, may have groove from tip to posterior margin. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.3, 1:0.9, 1:1.5, 1:1.2, 1:1.1, 1:1, 1:1.1. **Collum:** Absent. **Crista superior:** Well developed above ostium and after flexion, ridge-like over anterior cauda, poorly developed at tip. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Elongate and moderately deep. **Ventral depression:** Absent, may be shallow groove close to margin. **Rostrum:** Short, broad and sharply rounded or pointed. **Antirostrum:** Small and sharply rounded. **Excisura:** Moderate, notch shallow, angle acute.

#### *Lithognathus mormyrus*, SSF No. 183.21 PLATE 87

**DISTRIBUTION:** Mediterranean to the Cape and round coast to Mozambique, recorded from Red Sea but none found in tropical east Africa. Attains 55 cm.

**MATERIAL:** 9/32 (3.37-8.29 mm OD, 74-250 mm TL), PEM 4224, 4160, 4218, 4159, 4219, 7438, 7437, 7447, 0505; Cape south coast and Banga Nek; Id. GJBR, PCH, MJS.

**Otolith shape:** Approximately ovate to oblong. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded and raised in centre; **sculpture,** irregular. **Ventral margin:** Rounded and crenate or slightly irregular. **Posterior margin:** Sharply rounded or blunt and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, very low anterior, very indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Oval. **Cauda:** Angled slightly ventrally and gently flexed, tip short. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:0.9, 1:1, 1:0.9, 1:1.3, 1:1, 1:1, 1:1, 1:1, 1:0.9. **Collum:** Absent. **Crista superior:** Moderately well developed above ostium, ridge-like above cauda, well developed after flexion. **Crista inferior:** Moderately well developed under ostium, well developed under cauda. **Dorsal depression:** Oval. **Ventral depression:** Absent, may be shallow groove close to margin from ostium to caudal tip. **Rostrum:** Short, broad and sharply rounded. **Antirostrum:** Absent or small and sharply rounded. **Excisura:** Moderately wide, notch absent or shallow, angle acute.

#### *Pachymetopon aeneum*, SSF No. 183.22 PLATE 87

**DISTRIBUTION:** Known only from Cape to Sodwana Bay. Attains 50 cm.

**MATERIAL:** 6/36 (5.28-11.8 mm OD, 120-430 mm TL), PEM 5628, 5630, 10261, 6834, 6833, 9630; ORI and Cape south coast; Id. MJS, CDB.

**Otolith shape:** Approximately rhomboidal becoming oval to ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded; **sculpture,** lobed or crenate. **Ventral margin:** Rounded and crenate or slightly irregular. **Posterior margin:** Oblique and tapered to sharply rounded and crenate or irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph with very low anterior, indistinct poste-



rior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Approximately oval. **Cauda:** Well defined, straight and gently flexed near tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.1, 1:1, 1:1, 1:0.9, 1:1.4, 1:1.1. **Collum:** Absent. **Crista superior:** Well developed above ostium, ridge-like over cauda, well developed after flexion. **Crista inferior:** Well developed along sulcus, becomes a broad ridge in large otoliths. **Dorsal depression:** Oval becoming elongate from ostium to beyond flexion. **Ventral depression:** Absent. **Rostrum:** Moderate, broad and sharply rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Moderately wide, notch shallow, angle acute.

#### *Pachymetopon blochii*, SSF No. 183.23 PLATE 88

**DISTRIBUTION:** West coast of South Africa north to Angola, rarely east of Cape Agulhas. Attains 46 cm.

**MATERIAL:** 4/6 (9.04-11.2 mm OD, 263-385 mm TL), PEM 0510, 2090, 2193, 11991 (RUSI 27030); Tsitsikamma and off Cape Town; Id. PCH, MJS, SFRI, GJBR.

**Otolith shape:** Approximately oblong to ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Raised anteriorly then flattened; **sculpture**, crenate to irregular. **Ventral margin:** Rounded and dentate, crenate or irregular. **Posterior margin:** Oblique, tapered and sharply rounded or pointed, crenate or irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low anterior, very indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Oval, walls (especially ventral) poorly defined. **Cauda:** Relatively short, gently flexed along length. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1, 1:0.9, 1:1.1, 1:0.9. **Collum:** Absent. **Crista superior:** Moderately well developed above ostium, ridge-like over cauda, well developed after flexion. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Oval, may extend to flexion. **Ventral depression:** Absent. **Rostrum:** Broad, moderate and sharply rounded. **Antirostrum:** Absent or small and sharply rounded. **Excisura:** Moderately wide, notch, if present, shallow, angle acute.

#### *Pachymetopon grande*, SSF No. 183.24 PLATE 88

**DISTRIBUTION:** Found only from the Cape to Madagascar. Attains 65 cm.

**MATERIAL:** 9/33 (9.1-14.0 mm OD, 323-485 mm TL), PEM 5371, 5724, 8779, 6773, 15119, 0859, 0550, 0766, 5370; Cape south coast, Kosi Bay, Durban; Id. GJBR, MJS, CDB.

**Otolith shape:** Approximately oblong to ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded to notched and lobed; **sculpture**, crenate and irregular. **Ventral margin:** Rounded and crenate. **Posterior margin:** Sharply rounded to pointed, dentate to irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Oval, walls moderately well developed. **Cauda:** Deep with steep walls, becoming strongly flexed with growth. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1, 1:1.3, 1:1, 1:1.2, 1:0.9, 1:1, 1:1.4, 1:1.1. **Collum:** Absent. **Crista superior:** Well developed above ostium and after flexion, ridge-like above cauda. **Crista inferior:** Ridge-like below entire sulcus, distinctly broad under cauda. **Dorsal depression:** Oval to elongate from ostium to beyond flexion, may reach dorsal margin as dorsal area erodes with growth. **Ventral depression:** Narrow, groove-like under crista. **Rostrum:** Large, broad and sharply rounded. **Antirostrum:** Absent or small and sharply rounded. **Excisura:** Moderately wide, notch shallow, angle wide.

#### *Pagellus bellottii natalensis*, SSF No. 183.25 PLATE 88

**DISTRIBUTION:** This sub-species occurs only from about Mossel Bay to Madagascar. Attains 30 cm.

**MATERIAL:** 9/150 (1.98-9.8 mm OD, 44-234 mm TL), PEM 4243, 3196 (RUSI 11619), 4235, 8586, 6527, 6520, 6524, 3198 (RUSI 11619), 6012; Cape south coast and Natal; Id. MJS, PCH.

**Otolith shape:** Approximately rhomboidal becoming ovate. **Thickness:** Thick. **Form:** - Mesial convex, - Lateral approximately flat. **Dorsal margin:** Rounded becoming raised and flattened; **sculpture**, crenate or lobed. **Ventral margin:** Well rounded and crenate or irregular. **Posterior margin:** Sharply rounded in juveniles (< 4 mm OD), becoming oblique and distinctly angular. **Sculpture** crenate to irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph with low anterior, very indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Oval, dorsal walls steep. **Cauda:** Long, straight, flexed near tip, ending near posterior margin with groove from ventral margin to tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.2, 1:1.6, 1:1.7, 1:1.1, 1:1.3, 1:1.5, 1:1.2, 1:1.5, 1:1.3. **Collum:** Absent. **Crista superior:** Ridge-like from ostium to flexion, well developed after flexion, absent at tip. **Crista inferior:** Poorly developed under anterior ostium, well developed under rest of sulcus. **Dorsal depression:** Approximately oval and shallow. **Ventral depression:** Absent, groove from tip of ostium to caudal tip, close to margin. **Rostrum:** Short, broad and sharply rounded. **Antirostrum:** Absent to small and sharply rounded. **Excisura:** Moderately wide, notch shallow, angle acute or wide.

#### *Petrus rupestris*, SSF No. 183.26 PLATE 88

**DISTRIBUTION:** From Cape to Natal. Attains 2 m and 70 kg.

**MATERIAL:** 9/44 (2.0-23.8 mm OD, 58-c. 1200 mm TL), PEM 5594, 5623, 5858, 5648, 15125, 5649, 15129, 0300, 0512; Tsitsikamma, and Cape southeast coast; Id. GJBR, MJS.

**Otolith shape:** Initially oval (c. 2.0 mm OD) becoming ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Lateral surface:** A lip occurs on ventral margin in large otoliths (>11.6 mm OD). **Dorsal margin:** Rounded becoming flattened or emarginate; **sculpture**, serrate or crenate. **Ventral margin:** Rounded to flattened or slightly rounded and crenate or irregular. **Posterior margin:** Rounded becoming flattened or emarginate in large otoliths (c. 14.9 mm OD), and sharply rounded. **Sculpture** serrate, crenate or irregular. **Sulcus acusticus:** Ostial, may appear ostio-caudal in large otoliths, heterosulcoid. **Colliculum:** Heteromorph with well developed anterior and indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Approximately oval becoming elongate. **Cauda:** Initially slightly flexed, becoming slightly sinuous and strongly flexed near tip, tip not distinctly closed. May be a groove from ventral margin to tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.4, 1:1.1, 1:1, 1:1.1, 1:1, 1:1, 1:1, 1:1, 1:0.9. **Collum:** Absent. **Crista superior:** Well developed over ostium becoming ridge-like over cauda, well developed after flexion, absent at tip. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Oval to elongate, extending to flexion. **Ventral depression:** Absent, may be groove close to margin in large otoliths. **Rostrum:** Large, broad and sharply rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Moderately wide, notch shallow, angle acute.

#### *Polyamblyodon germanum*, SSF No. 183.27 PLATE 89

**DISTRIBUTION:** East London to Delagoa Bay; not uncommon off Transkei. Attains 45 cm.

**MATERIAL:** 1/1 (10.96 mm OD, 400 mm TL?), 1757H; locality not recorded.



**Otolith shape:** Stubby oval-ovate. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded to flattened; **sculpture,** irregular. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Oblique, sharply rounded or angled, bluntly pointed and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low anterior, very indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Oval and broad. **Cauda:** Short, deep and sharply flexed, tip undercuts ventral area. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.2. **Collum:** Absent, step up to cauda. **Crista superior:** Well developed over ostium, ridge-like over anterior cauda, well developed after flexion. **Crista inferior:** Well developed under ostium, broad ridge under cauda, well developed at tip. **Dorsal depression:** Shallow and elongate; ridge above depression close to dorsal margin. **Ventral depression:** Narrow depression or groove under cauda. **Rostrum:** Short, broad and sharply rounded. **Antirostrum:** Short and sharply rounded. **Excisura:** Moderately wide, notch shallow, angle acute.

***Polyamblyodon gibbosum*, SSF No. 183.28 PLATE 89**

**DISTRIBUTION:** Natal to Beira and Madagascar. Attains 50 cm. **MATERIAL:** 7/11 (8.18-13.0 mm OD, c. 350-540 mm TL), PEM 0393, 8548, 9628, 1756H, 8810, 9629, 2726; Natal, Kosi Bay and Sodwana Bay; Id. MJS, MMS, TH.

**Otolith shape:** Approximately ovate. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral slightly concave. **Dorsal margin:** Raised posteriorly and lobed; **sculpture,** crenate, and irregular. **Ventral margin:** Rounded and angled, slightly crenate or irregular. **Posterior margin:** Rounded, may be oblique, crenate or irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph with low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Oval and elongate, dorsal wall very short. **Cauda:** Straight, deepening and sharply flexed posteriorly with steep walls, groove from margin at tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:0.8, 1:0.9, 1:0.8, 1:1.1, 1:0.8, 1:0.8, 1:1.1. **Collum:** Absent. **Crista superior:** Short, well developed over ostium, broad ridge over anterior cauda, well developed after flexion. **Crista inferior:** Well developed under ostium, may be low ridge under cauda. **Dorsal depression:** Oval, deep and may open to dorsal margin. **Ventral depression:** Absent. **Rostrum:** Large, elongate, broad and rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Wide, notch shallow, angle varies.

***Polysteganus coeruleopunctatus*, SSF No. 183.29 PLATE 89**

**DISTRIBUTION:** Red Sea to Natal south coast. Attains 60 cm.

**MATERIAL:** 3/4 (12.98-16.92 mm OD, c. 390-407 mm TL), PEM 2703, 6376, 2731; Sodwana Bay and Port Durnford; Id. MMS, MJS.

**Otolith shape:** Rhomboidal. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral slightly concave. **Dorsal margin:** Rounded and notched; **sculpture,** dentate. **Ventral margin:** Rounded and angular, dentate to crenate. **Posterior margin:** Oblique and sharply rounded, dentate to digitate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph with low anterior and posterior colliculi. **Pseudocolliculum:** Absent. **Ostium:** Oval, relatively short. **Cauda:** Angled and gently flexed, relatively long, ends near ventral margin, may be groove from margin to tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.3, 1:1.7, 1:1.2. **Collum:** Absent. **Crista superior:** Well developed over ostium and after flexion, well developed to ridge-like along cauda. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Very shallow and elongate from ostium to flexion. **Ventral depression:** May be

a small, shallow depression anterior to caudal tip, shallow groove near margin. **Rostrum:** Short, broad and sharply rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Moderately wide, notch very shallow, angle wide.

***Polysteganus praeorbitalis*, SSF No. 183.31 PLATE 89**

**DISTRIBUTION:** Known only from Algoa Bay to Beira. Attains 90 cm.

**MATERIAL:** 6/65 (7.6-17.46 mm OD, 233-893 mm TL), PEM 6797, 8341, 2935, 10330, 6229, 2851; south-eastern Cape and Port Durnford; Id. MJS.

**Otolith shape:** Oblong to ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Rounded; **sculpture,** dentate to serrate. **Ventral margin:** Slightly rounded becoming flattened and crenate to irregular. **Posterior margin:** Oblique and sharply rounded, crenate, serrate or dentate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph with low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Oval, flared dorsally and ventrally. **Cauda:** Slightly sinuous, flexed and deeper near tip, flexed part parallel with posterior wall, tip closed. **Ostio-caudal differentiation:** Dorso-ventral constrictions. **Ostium/cauda:** 1:1.2, 1:1.1, 1:1.3, 1:1, 1:1.4, 1:1.6. **Collum:** Absent. **Crista superior:** Well developed above ostium, ridge-like over cauda, well developed after flexion. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Elongate from ostium to flexion. **Ventral depression:** Absent, shallow groove runs anteriorly from caudal tip along margin. **Rostrum:** Large, broad and sharply rounded or rounded. **Antirostrum:** Absent or small and sharply rounded. **Excisura:** Moderately wide, notch shallow, angle acute.

***Polysteganus undulosus*, SSF No. 183.32 PLATE 89**

**DISTRIBUTION:** Known only from the Cape to Delagoa Bay. Attains 100 cm, 15 kg.

**MATERIAL:** 5/80 (9.4-14.9 mm OD, 241-497 mm FL), PEM 11755, 11752, 11756, 11758, 11763; southeast coast; Id. MJS.

**Otolith shape:** Rhomboidal becoming approximately ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Flattened; **sculpture,** dentate, crenate or serrate. **Ventral margin:** Rounded and angular, dentate, serrate or crenate. **Posterior margin:** Oblique and sharply rounded, crenate or dentate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low anterior and posterior colliculi. **Pseudocolliculum:** Absent. **Ostium:** Elongate and oval. **Cauda:** Gently flexed near tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1, 1:0.9, 1:1.1, 1:1.3, 1:1. **Collum:** Absent. **Crista superior:** Well developed above ostium and after flexion, ridge-like above cauda. **Crista inferior:** Well developed along cauda. **Dorsal depression:** Oval to elongate and shallow, from ostium to flexion. **Ventral depression:** Absent, may be a groove from ventral margin near caudal tip. **Rostrum:** Large, broad and sharply rounded. **Antirostrum:** Absent or small, sharply rounded or pointed. **Excisura:** Moderately wide, notch shallow, angle varies.

***Porcostoma dentata*, SSF No. 183.33 PLATE 89**

**DISTRIBUTION:** Occurs only in southern Africa, mainly from Beira to Durban, juveniles to the Cape south coast. Attains 30 cm.

**MATERIAL:** 7/31 (2.5-8.62 mm OD, 57-285 mm TL), PEM 4102, 5471, 5312, 7528 (RUSI 21233), 8653, 7501, 2083; Bird Island (Algoa Bay), Natal and Cape south coast; Id. PCH, RvdE, MJS.

**Otolith shape:** Ovate and squat. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded or flattened; **sculpture,** sinuate (c. 2.5 mm OD), becoming crenate to irregular. **Ventral margin:** Rounded becoming slightly rounded and crenate to irregular. **Posterior margin:** Flattened to



slightly rounded and crenate. **Sulcus acusticus:** Ostial, may appear ostio-caudal at c. 8.3 mm OD, heterosulcoid. **Colliculum:** Heteromorph with low anterior, very indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Oval, flared dorsally. **Cauda:** Slightly angled ventrally, deepening posteriorly, with short flex near tip which extends closer to ventral margin with growth. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.1, 1:1, 1:1, 1:1.1, 1:1, 1:0.9, 1:0.8. **Collum:** Absent. **Crista superior:** Ridge-like above ostium to flexion, well developed after flexion, may be well developed over ostium in large otoliths (>8 mm OD). **Crista inferior:** Poorly developed below ostium, well developed below cauda. **Dorsal depression:** Elongate, becoming shallower with growth. **Ventral depression:** Absent, very shallow groove from ostium to caudal tip, may be a small depression anterior to caudal tip in large otoliths (>8 mm OD). **Rostrum:** Short, broad and sharply rounded. **Antirostrum:** Minute and sharply rounded. **Excisura:** Moderately wide, notch shallow, angle acute or wide.

#### *Pterogymnus laniarius*, SSF No. 183.34 PLATE 90

**DISTRIBUTION:** Occurs from the Cape to East London; rarely reaches Beira. Attains 40 cm.

**MATERIAL:** 8/129 (2.22-13.8 mm OD, 46-342 mm TL), PEM 5455, 11644, 11641, 3071, 11639, 3086 (RUSI 11636), 3088 (RUSI 11636), 8601; Natal and Cape south coast; Id. MJS, PCH.

**Otolith shape:** Rounded ovate (c. 2.2 mm OD) becoming rhomboidal (c. 6 mm OD). **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral slightly concave. **Dorsal margin:** Rounded in juveniles, becoming raised and flattened; **sculpture**, sinuate to crenate. **Ventral margin:** Well rounded and crenate. **Posterior margin:** Oblique, sharply rounded and crenate to serrate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Oval. **Cauda:** Horizontal and straight, moderately long and gently flexed near tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.3, 1:1.7, 1:1.3, 1:1.1, 1:1.2, 1:1.2, 1:1.2, 1:1.3. **Collum:** Absent. **Crista superior:** Ridge-like over ostium and cauda, well developed near tip. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Moderately deep, elongate from ostium to flexion. **Ventral depression:** Small, under caudal tip, a shallow groove runs from ostium to caudal tip. **Rostrum:** Short, broad and pointed (c. 2.2 mm OD) becoming rounded to sharply rounded. **Antirostrum:** Short, broad and rounded (c. 2.2 mm OD) becoming small and sharply rounded with growth. **Excisura:** Moderately wide, notch shallow, angle varies.

#### *Rhabdosargus globiceps*, SSF No. 183.35 PLATE 90

**DISTRIBUTION:** Found only from Angola to Natal. Attains 50 cm.

**MATERIAL:** 6/31 (5.19-11.5 mm OD, 139-375 mm TL), PEM 1311, 3781, 2171 (RUSI 11450), 2174 (RUSI 11450), 5704, 11376, [2172, 2173 (both RUSI 11450)]; Cape south coast; Id. MJS, PCH.

**Otolith shape:** Ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral slightly concave. **Dorsal margin:** Slightly rounded (c. 5 mm OD) becoming flattened; **sculpture**, crenate, lobed or irregular. **Ventral margin:** Rounded and crenate to irregular. **Posterior margin:** Oblique and sharply rounded, crenate or irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph with low anterior, very indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Elongate oval, ventral wall approximately horizontal. **Cauda:** Short, gently flexed ventrally more strongly flexed dorsally. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.4, 1:1.1, 1:1.3, 1:1.1, 1:1.1, 1:1.1. **Collum:** Absent. **Crista superior:**

Well developed over ostium and after flexion, ridge-like above anterior cauda. **Crista inferior:** Poorly developed under anterior ostium, well developed elsewhere. **Dorsal depression:** Oval, moderately deep. **Ventral depression:** May be small and shallow under ostium. **Rostrum:** Large, broad and sharply rounded. **Antirostrum:** Absent. **Excisura:** Moderately wide, notch absent.

#### *Rhabdosargus holubi*, SSF No. 183.36 PLATE 90

**DISTRIBUTION:** Found only from the Cape to Natal. Attains 35 cm.

**MATERIAL:** 8/100 (3.4-9.5 mm OD, 88-298 mm TL), PEM 5434, 2480, 3860 (RUSI 11956), 1026, 2460, 2472, 1147, 6573; Natal and Cape south coast; Id. PCH, HMK, MJS.

**Otolith shape:** Ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave, increases with growth. **Dorsal margin:** Slightly raised and approximately flat; **sculpture**, crenate or irregular. **Ventral margin:** Rounded becoming slightly rounded and crenate to irregular. **Posterior margin:** Oblique and sharply rounded, crenate or irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, very low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Oval, flared dorsally and ventrally. **Cauda:** Short, slightly angled ventrally, with short flexion and slightly pointed tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted (>8 mm OD may have ventral constriction only). **Ostium/cauda:** 1:1.2, 1:1.1, 1:1.2, 1:1.2, 1:1, 1:1, 1:1.1, 1:1.4. **Collum:** Absent, may be slight step to cauda. **Crista superior:** Ridge-like from ostium to flexion, well developed to tip. **Crista inferior:** Well developed along sulcus. **Dorsal depression:** Oval and moderately deep. **Ventral depression:** Shallow depression under caudal tip and very shallow groove near margin from ostium to cauda. **Rostrum:** Short, broad and sharply rounded or blunt. **Antirostrum:** Absent or minute and sharply rounded. **Excisura:** Moderately wide, notch absent or very shallow, angle wide.

#### *Rhabdosargus sarba*, SSF No. 183.37 PLATE 90

**DISTRIBUTION:** Red Sea and tropical Indo-West Pacific region. Common in Natal, reaches Knysna. Attains >12 kg.

**MATERIAL:** 6/25 (4.8-14.4 mm OD, c. 90-590 mm FL), PEM 0017, 9605, 6770, 1976, 2225, 6464; Natal and southern Cape; Id. HMK, MJS, RvdE.

**Otolith shape:** Ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Lateral surface:** Has ventral lip except in small otoliths (<4.8 mm OD). **Dorsal margin:** Raised and flattened becoming notched; **sculpture**, irregular. **Ventral margin:** Slightly rounded and crenate or slightly irregular. **Posterior margin:** Oblique, blunt, postero-ventral corner becomes spurred, crenate to slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph with very low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Oval, flared dorsally and ventrally. **Cauda:** Horizontal, sharply flexed and deep, walls become steep (c. 12 mm OD). **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1, 1:1, 1:0.9, 1:0.9, 1:0.8 1:1.4. **Collum:** Absent. **Crista superior:** Poorly developed over ostium, ridge-like over cauda, well developed after flexion. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Elongate and shallow. **Ventral depression:** Absent, short groove anterior to caudal tip in large otoliths (c. 12 mm OD). **Rostrum:** Large, broad and sharply rounded or blunt. **Antirostrum:** Absent. **Excisura:** Moderately wide or wide, notch absent.

#### *Rhabdosargus thorpei*, SSF No. 183.38 PLATE 91

**DISTRIBUTION:** Known from Natal, may reach Port Alfred. Attains 40 cm.



**MATERIAL:** 8/16 (4.9-10.56 mm OD, 110-277 mm FL), PEM 6659, 6662, 6734 (RUSI 28490), 6657 (RUSI 34093), 6735, 5998, 0458, 6114; Mbibi and Durban; Id. MJS, PCH, RvdE.

**Otolith shape:** Ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Raised and flattened; **sculpture**, crenate and lobed. **Ventral margin:** Slightly rounded and crenate or irregular. **Posterior margin:** Oblique and sharply rounded, crenate or irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph with extremely low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Oval, flared dorsally and ventrally. **Cauda:** Slightly angled ventrally, flexed near tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1, 1:1.1, 1:1.1, 1:1.1, 1:1.1, 1:1.2, 1:1, 1:1.3. **Collum:** Absent. **Crista superior:** Ridge-like to flexion then well developed. **Crista inferior:** Well developed along sulcus. **Dorsal depression:** Oval to elongate. **Ventral depression:** May be a depression posterior to cauda (>5.3 mm OD) and may be ventral groove near margin (>10 mm OD). **Rostrum:** Large, broad and sharply rounded or blunt. **Antirostrum:** Absent or minute and sharply rounded. **Excisura:** Moderately wide, notch absent or very shallow, angle wide.

### *Sarpa salpa*, SSF No. 183.39 PLATE 91

**DISTRIBUTION:** Mediterranean and eastern Atlantic round South Africa to southern Mozambique. Attains 45 cm.

**MATERIAL:** 7/80 (2.8-8.21 mm OD, 74-346 mm TL), PEM 5147, 5146, 5148, 4953, 1351, 1352, 2111, [15527 (RUSI 42652)]; southern Cape coast; Id. MJS.

**Otolith shape:** Roundly ovate (c. 3 mm OD) to oblong (c. 7 mm OD). **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Lateral surface:** Groove under ostium. **Dorsal margin:** Rounded to flattened; **sculpture**, sinuate or irregular. **Ventral margin:** Rounded becoming flattened and crenate or irregular. **Posterior margin:** Rounded (c. 3 mm OD) becoming oblique and slightly emarginate (c. 6 mm OD) and ventral corner protruded and pointed. **Sculpture** sinuate, crenate or irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph with low anterior, very indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Oval and elongate. **Cauda:** Gently flexed (c. 3 mm OD), straight and flexed near tip, which is parallel with posterior wall (c. 8 mm OD). **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1, 1:0.9, 1:0.9, 1:0.9, 1:1.1, 1:0.9, 1:0.8. **Collum:** Absent. **Crista superior:** Well developed above ostium, ridge-like over cauda, well developed after flexion. **Crista inferior:** Moderately well developed along sulcus. **Dorsal depression:** Elongate from ostium to flexion, dorsal area reduced and narrow. **Ventral depression:** Absent. **Rostrum:** Large, broad and sharply rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Moderately wide, notch shallow, angle acute.

### *Sparodon durbanensis*, SSF No. 183.40 PLATE 91

**DISTRIBUTION:** Found only from the Cape to Natal. Attains c. 115 cm.

**MATERIAL:** 8/43 (1.5-13.4 mm OD, 32-950 mm TL), PEM 6029, 5546, 5547, 4723, 5541, 6195, 6194, 6385; Algoa Bay and vicinity; Id. MJS, CDB, JRC.

**Otolith shape:** Rounded-ovate becoming oblong-ovate or fusiform. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Rounded (<4 mm OD) becoming emarginate and raised at posterior; **sculpture**, irregular. **Ventral margin:** Rounded to slightly rounded and slightly irregular. **Posterior margin:** Rounded to oblique, flattened and sharply rounded, lobed to irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph with low, depressed anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Oval, in large otoliths it flares ventrally and lies mainly

on rostrum (c. 10 mm OD). **Cauda:** Slightly flexed (c. 2 mm OD), becoming flexed and extremely deep (c. 6 mm OD), tip ends near postero-ventral corner. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.2, 1:1.3, 1:1, 1:1.1, 1:1, 1:0.9, 1:1.1, 1:0.9. **Collum:** Absent, may be slight step to cauda. **Crista superior:** Poor over ostium, broad ridge in large (c. 10 mm OD), well developed after flexion. **Crista inferior:** Well developed with steep walls to cauda. **Dorsal depression:** Oval and shallow, dorsal area reduces with growth. **Ventral depression:** Absent, may be short groove near ventral margin. **Rostrum:** Large, broad and sharply rounded. **Antirostrum:** Small and rounded. **Excisura:** Moderate becoming wide, notch shallow, angle acute.

### *Spondyliosoma emarginatum*, SSF No. 183.41

#### PLATE 91

**DISTRIBUTION:** Known from Saldanha Bay to Natal, common on Cape south coast. Attains 45 cm.

**MATERIAL:** 10/46 (3.6-10.5 mm OD, 78-335 mm TL), PEM 4145, 4211 (RUSI 12779), 4147, 3272 (RUSI 11621), 3271 (RUSI 11621), 3275, 3274, 3273 (RUSI 11621), 6821, 11996; Cape south coast; Id. MJS, PCH.

**Otolith shape:** Approximately ovate becoming oblong-ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly raised and slightly rounded; **sculpture**, crenate with mid-dorsal knob. **Ventral margin:** Rounded and crenate. **Posterior margin:** Oblique, sharply rounded and crenate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, very low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Oval, moderately narrow, dorsal margin may be slightly flared. **Cauda:** Approximately straight, slightly angled ventrally, short flexion tapers near tip. Tip not distinctly closed, may be joined by groove from ventral margin. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.2, 1:1.2, 1:1.2, 1:1.1, 1:0.9, 1:1.1, 1:1.1, 1:1.2, 1:1, 1:1.3. **Collum:** Absent, low step to cauda. **Crista superior:** Well developed over ostium, well developed to ridge-like over cauda, poor at tip. **Crista inferior:** Well developed under entire sulcus. **Dorsal depression:** Oval or elongate and moderately deep. **Ventral depression:** Absent, may be very shallow groove from mid-ostium to caudal tip, close to margin. **Rostrum:** Moderate, broad and sharply rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Moderately wide, notch shallow, angle acute or wide.

### CENTRACANTHIDAE Nelson No 323

**Family characteristics:** Two species described. Otoliths similar in form to Sparidae. Rhomboidal or oval to oblong, up to c. 12 mm OD. Heterosulcoid with ostial opening. Ostium oval or oblong with narrow, flexed cauda. Heteromorph, anterior colliculum may be distinct, posterior very low and indistinct. Cristae well developed, may be ridge-like over anterior cauda.

#### Key

- 1a. Otolith rhomboidal, well-rounded ventral margin; ostium oval and broad, usually with distinctly raised anterior colliculum . . . . . *Spicara australis* 184.1
- 1b. Otolith oval to oblong, ventral margin rounded or slightly rounded; ostium oval to oblong, anterior colliculum low and indistinct . . . *Spicara axillaris* 184.2

### *Spicara australis*, SSF No. 184.1 PLATE 91

**DISTRIBUTION:** Known only from off Natal. Attains 30 cm.

**MATERIAL:** 4/8 (6.8-10.72 mm OD, 164-275 mm TL), PEM 14987, 14988, (14985-14989 all RUSI 35596), 0619, 0620; Durban and Transkei; Id. GJBR, MJS, MEA.

**Otolith shape:** Rhomboidal. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:**



Angular and flat, or rounded; **sculpture**, irregular. **Ventral margin**: Rounded or well rounded and serrate. **Posterior margin**: Approximately rounded and irregular. **Sulcus acusticus**: Ostial, heterosulcoid. **Colliculum**: Heteromorph, distinct anterior, very low posterior colliculum. **Pseudocolliculum**: Absent. **Ostium**: Moderately broad, with distinct colliculum. **Cauda**: Straight, flexed at tip. **Ostio-caudal differentiation**: Dorso-ventrally constricted. **Ostium/cauda**: 1:1.4, 1:1.1, 1:1.3, 1:1.5. **Collum**: Absent, slight step to cauda. **Crista superior**: Well developed above ostium, ridge-like above anterior cauda, well developed after flexion. **Crista inferior**: Well developed along entire sulcus. **Dorsal depression**: Elongate and oval. **Ventral depression**: Absent. **Rostrum**: Short, broad and rounded. **Antirostrum**: Minute and sharply rounded. **Excisura**: Moderate, notch very shallow, angle acute.

#### *Spicara axillaris*, SSF No. 184.2 PLATE 91 & 92

**DISTRIBUTION**: Known only from Cape Town to Natal. Attains 38 cm.

**MATERIAL**: 6/45 (5.8-12.0 mm OD, 132-307 mm TL), PEM 11602 (RUSI 28473), 12212, 12556 (RUSI 28378), 12565, 12188, 12211, [7819 (RUSI 20113)]; Cape south coast; Id. MJS, PCH.

**Otolith shape**: Oval to oblong. **Thickness**: Moderate, thickening with growth. **Form**: - **Mesial** convex, - **Lateral** concave. **Dorsal margin**: Slightly rounded; **sculpture**, crenate or irregular. **Ventral margin**: Rounded (<c. 5.5 mm OD) becoming slightly rounded, crenate and irregular. **Posterior margin**: Sharply rounded to angular and dentate to irregular. **Sulcus acusticus**: Ostial, heterosulcoid. **Colliculum**: Heteromorph with low anterior, indistinct posterior colliculum. **Pseudocolliculum**: Absent. **Ostium**: Oval to oblong. **Cauda**: Moderately long, straight and flexed at tip. **Ostio-caudal differentiation**: Dorso-ventrally constricted. **Ostium/cauda**: 1:1, 1:1.1, 1:1.1, 1:1.1, 1:1.5, 1:1.3. **Collum**: Absent. **Crista superior**: Well developed along entire sulcus, may be low ridge over anterior cauda. **Crista inferior**: Well developed under entire sulcus. **Dorsal depression**: Oval and moderately deep. **Ventral depression**: Absent, may be shallow groove close to margin in large otoliths (c. 9 mm OD). **Rostrum**: Large, broad and rounded, sharply rounded in small otoliths (<c. 9 mm OD). **Antirostrum**: Minute and sharply rounded. **Excisura**: Moderately wide with very shallow notch, angle wide.

#### LETHRINIDAE Nelson No 324

**Family characteristics**: Otoliths similar to those of the Sparidae. Oval-ovate otoliths up to at least 16 mm OD, with ostial openings. Postero-ventral corner generally pointed or sharply rounded. Heterosulcoid with broad ostium and narrower, flexed cauda. Heteromorph, with low or indistinct colliculi.

##### Key

- 1a. Otoliths ovate; rostrum elongate and pointed or rounded . . . . . 2
- 1b. Otoliths oval or rounded-ovate; rostrum not distinctly elongate . . . . . 5
- 2a. Ostium flared ventrally, extends around anterior of rostrum onto ventral margin; antirostrum with groove to excisura; cauda very broad and deep . . . . . *Gnathodentex aureolineatus* 185.1
- 2b. Ostium not flared onto ventral margin; antirostrum without groove to excisura; cauda not distinctly wide . . . . . 3
- 3a. Ventral margin of otolith sinuate to flat; rostrum tapered and sharply rounded; ostium widely flared dorsally and ventrally; cauda strongly flexed . . . . . *Monotaxis grandoculis* 185.19

- 3b. Ventral margin slightly rounded, not sinuate; rostrum large broad and sharply rounded; ostium not widely flared dorsally and ventrally; cauda flexed near tip . . . 4
- 4a. Dorsal margin of otolith flattened, area reduced and narrow; ostium elongate and oval; crista superior broad and ridge-like over anterior cauda . . . . . *Gymnocranius robinsoni* 185.3
- 4b. Dorsal margin slightly rounded or slightly raised and flattened, area wide; ostium broad and elongate; crista superior a moderately narrow ridge over anterior cauda . . . . . *Gymnocranius griseus* 185.2
- 5a. Otolith short, broad, with dorsal margin well rounded or raised; posterior margin blunt to rounded (but may have pointed ventral corner) . . . . . 6
- 5b. Otolith relatively more elongate; posterior margin of otolith rounded . . . . . 8
- 6a. Dorsal margin of otolith raised with groove in dorsal area; caudal tip meets posterior groove; ventral margin of otolith notched posteriorly. . . *Lethrinus mahsena* 185.11
- 6b. Dorsal margin raised but without groove in dorsal area; no indentation in ventral margin under caudal tip . . . 7
- 7a. Ostium broad, its dorsal wall sloping and irregular; cauda moderately wide, flexed along its length; posterior margin of otolith rounded . . . . . *Lethrinus mahsenoides* 185.12
- 7b. Ostium slightly flared dorsally and ventrally; cauda sharply flexed and deep at tip; posterior margin of otolith oblique and flattened . . . *Lethrinus sanguineus* 185.16
- 8a. Postero-ventral corner angled or slightly extended and rounded; ventral area wide . . . . . 9
- 8b. Postero-ventral corner rounded or sharply rounded; ventral area usually narrower . . . . . 10
- 9a. Cauda gently flexed along its length; caudal tip ends relatively far from ventral margin; ventral area under caudal tip not distinctly depressed; ridge under postero-ventral corner on lateral surface . . . . . *Lethrinus crocineus* 185.5
- 9b. Cauda flexed, deeper near tip; caudal tip ends relatively close to ventral margin; ventral area has groove or margin depressed; lateral surface with no ridge on lateral surface . . . . . *Lethrinus nebulosus* 185.13
- 10a. Caudal tip with groove to ventral depression below; rostrum tapered, often pointed. . . . . *Lethrinus elongatus* 185.6
- 10b. Caudal tip not joined by groove; rostrum sharply rounded, not distinctly tapered . . . . . 11
- 11a. Ostium relatively elongate, slightly flared ventrally, opens onto rostrum; excisura extending round below rostral tip; dorsal edge of rostrum raised . . . . . *Lethrinus variegatus* 185.17
- 11b. Ostium relatively short and oval; excisura opens down to rostral tip, not below it; otolith with rounded appearance . . . . . *Lethrinus rubrioperculatus* 185.15

#### *Gnathodentex aureolineatus*, SSF No. 185.1 PLATE 92

**DISTRIBUTION**: Indo-West Pacific. south to Natal. Attains >30 cm.

**MATERIAL**: 2/3 (4.95, 5.9 mm OD, 200, 284 mm TL), PEM 15671, 14532 (RUSI 31466); Comoro Ids, Mauritius; Id. MJS, PCH.

**Otolith shape**: Rounded-ovate. **Thickness**: Moderately thick. **Form**: - **Mesial** strongly convex, - **Lateral** strongly concave. **Dorsal margin**: Slightly rounded; **sculpture**, crenate to irregular. **Ventral margin**: Slightly rounded and slightly crenate to irregular.



***Lethrinus crocineus*, SSF No. 185.5 PLATE 92**

**DISTRIBUTION:** Western Indian Ocean, south to Natal. Attains 60 cm.

**MATERIAL:** 3/11 (8.2-12.6 mm OD, 250-455 mm TL), PEM 8334, 8372, 8373; Kosi Bay; Id. MJS, PCH.

**Otolith shape:** Approximately oval. **Thickness:** Moderate. **Form:** - Mesial strongly convex, - Lateral strongly concave. **Lateral surface:** Raised ridge at postero-ventral corner. **Dorsal margin:** Rounded; sculpture, crenate to irregular. **Ventral margin:** Rounded and irregular. **Posterior margin:** Sharply rounded or pointed and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, with low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Oval and broad, ventral margin slightly sinuous. **Cauda:** Gently flexed along its length. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.2, 1:1.2, 1:1.6. **Collum:** Absent. **Crista superior:** Well developed above ostium, ridge-like over cauda, poor at tip. **Crista inferior:** Well developed below entire sulcus. **Dorsal depression:** Elongate and crescent shaped. **Ventral depression:** Shallow below caudal tip. **Rostrum:** Short, broad and rounded. **Antirostrum:** Minute and pointed. **Excisura:** Moderately wide, notch shallow, angle acute.

***Lethrinus elongatus*, SSF No. 185.6 PLATE 92**

**DISTRIBUTION:** Indo-West Pacific from Natal northwards. Attains 100 cm.

**MATERIAL:** 3/45 (6.1-9.2 mm OD, 198-353 mm TL), PEM 8505, 8490, 8488; Sodwana Bay; Id. MJS, PCH.

**Otolith shape:** Oval to oblong. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Rounded; sculpture, crenate. **Ventral margin:** Rounded and crenate or irregular. **Posterior margin:** Sharply rounded and irregular to dentate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph with low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Oval, not deep, flares slightly anteriorly. **Cauda:** Initially straight, flexed at posterior, deepening at tip. Tip closed but intersected by groove from ventral margin. **Ostio-caudal differentiation:** Dorso-ventral constrictions. **Ostium/cauda:** 1:1.1, 1:1.8, 1:1.4. **Collum:** Absent. **Crista superior:** Well developed above ostium, ridge-like above cauda, well developed after flexion, poor at tip. **Crista inferior:** Moderately well developed along sulcus. **Dorsal depression:** Crescentic. **Ventral depression:** Only a posterior depression under caudal tip, may be shallow groove close to margin. **Rostrum:** Large, broad and pointed. **Antirostrum:** Small and pointed. **Excisura:** Moderately wide, notch shallow, angle acute or wide.

***Lethrinus mahsena*, SSF No. 185.11 PLATE 92**

**DISTRIBUTION:** Indo-West Pacific, south to Sodwana Bay. Attains 38 cm.

**MATERIAL:** 1/2 (10.28 mm OD, 424 mm TL), 1357H; Eilat; Id. AD.

**Otolith shape:** Approximately oval to ovate. **Thickness:** Moderately thick. **Form:** - Mesial strongly convex, - Lateral strongly concave. **Lateral surface:** Raised ridge at postero-ventral corner. **Dorsal margin:** Rounded and raised; sculpture, irregular or lobed. **Ventral margin:** Rounded and indented posteriorly, crenate or approximately irregular. **Posterior margin:** Rounded with pointed postero-ventral corner, serrate to dentate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, colliculi indistinct. **Pseudocolliculum:** Absent. **Ostium:** Oval, ventral wall slightly sinuous. **Cauda:** Strongly flexed in posterior half, a vertical channel intersects cauda below flexion. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.4. **Collum:** Absent. **Crista superior:** Poorly developed above

**Posterior margin:** Rounded, notched ventrally and dentate to irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, very indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Wide, covers most of rostrum, flared ventrally, opening on to anterior and ventral surface, deeper than cauda. **Cauda:** Deep, wide with steep walls, very sharp flexion at tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.5, 1:1.2. **Collum:** Absent, slight step to cauda. **Crista superior:** Ridge-like over anterior cauda, well developed elsewhere. **Crista inferior:** Poorly developed below ostium, well developed below cauda, may have low ridge under anterior cauda. **Dorsal depression:** Oval and shallow. **Ventral depression:** Absent, groove from caudal tip to ostium close to margin. **Rostrum:** Large, broad and rounded. **Antirostrum:** Large and pointed with groove to excisura. **Excisura:** Wide, notch moderate, angle acute.

***Gymnocranius griseus*, SSF No. 185.2 PLATE 92**

**DISTRIBUTION:** Indo-West Pacific south to Natal. Attains 80 cm.

**MATERIAL:** 3/26 (5.7-7.7 mm OD, 175-300 mm TL), PEM 8544 (RUSI 34074), 14538, 14542; Mauritius and Kosi Bay; Id. MJS, PCH, MEA.

**Otolith shape:** Ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded or slightly raised and flattened; sculpture, slightly crenate or slightly irregular. **Ventral margin:** Slightly rounded and crenate to irregular. **Posterior margin:** Rounded and crenate to irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph with very low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Broad and elongate, flared ventrally, mainly on rostrum, moderately deep, ending in a V-shape. **Cauda:** Flexed at tip, moderately deep. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.2, 1:1.1, 1:1. **Collum:** Absent, step to cauda. **Crista superior:** Well developed above ostium and after flexion, ridge-like above anterior cauda. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Large and shallow. **Ventral depression:** Absent, very shallow groove close to margin. **Rostrum:** Large, broad and sharply rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Wide, notch shallow, angle wide.

***Gymnocranius robinsoni*, SSF No. 185.3 PLATE 92**

**DISTRIBUTION:** Indo-West Pacific south to Sodwana Bay. Attains 60 cm.

**MATERIAL:** 1/2 (10 mm OD, 450 mm TL), PEM 8510; Sodwana Bay.

**Otolith shape:** Ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Flat; sculpture, crenate to irregular. **Ventral margin:** Slightly rounded and irregular. **Posterior margin:** Slightly rounded to blunt, may be notched and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Elongate and oval, penetrating the neck posteriorly, lying mainly along the rostrum. **Cauda:** Initially straight, flexed and deepening near tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1. **Collum:** Absent. **Crista superior:** Well developed above ostium and after flexion, broad and ridge-like along anterior cauda, poorly developed at tip. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Oval and flat, almost reaches dorsal margin. **Ventral depression:** Absent, groove near margin from caudal tip. **Rostrum:** Large, broad and sharply rounded. **Antirostrum:** Short and sharply rounded. **Excisura:** Wide, notch shallow, angle acute.



ostium, ridge-like along cauda, very poorly developed at caudal tip. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Elongate, follows cauda, dorsal groove below raised area, parallel to anterior cauda, intersects dorsal margin. **Ventral depression:** Absent, one groove behind caudal tip and another near ventral margin. **Rostrum:** Short, broad and tip pointed. **Antirostrum:** Absent. **Excisura:** Moderate, notch absent.

***Lethrinus mahsenoides*, SSF No. 185.12 PLATE 92**

**DISTRIBUTION:** Red Sea and Indo-West Pacific to Sodwana Bay. Attains c. 20 cm.

**MATERIAL:** 5/23 (6.1-9.8 mm OD, 165-280 mm TL), PEM 8323, 8210, 8540, 8308 (RUSI 34155), 8461 (RUSI 37498), [8353 (RUSI 37498), 8324 (RUSI 37465), 8403 (RUSI 37471)]; Sodwana Bay and Kosi Bay; Id. MJS, PCH.

**Otolith shape:** Approximately oval to ovate. **Thickness:** Moderately thick to thick. **Form:** - **Mesial** convex, - **Lateral** slightly concave. **Dorsal margin:** Raised; **sculpture**, irregular. **Ventral margin:** Rounded and crenate or irregular. **Posterior margin:** Rounded with pointed postero-ventral corner and very irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Approximately oval and broad, dorsal wall angled. **Cauda:** Fairly short and flexed along its length with steep walls. **Ostio-caudal differentiation:** Dorso-ventral constrictions. **Ostium/cauda:** 1:1, 1:1.1, 1:1.1, 1:1.3, 1:1.2. **Collum:** Absent, may be small step to cauda (<c. 6 mm OD). **Crista superior:** Moderately well developed above ostium and close to tip, ridge-like above cauda. **Crista inferior:** Moderately well developed under ostium, well developed under cauda. **Dorsal depression:** Crescentic, following cauda, posterior area is irregular, may have indentation near cauda. **Ventral depression:** Absent, may be very shallow groove near ventral margin. **Rostrum:** Broad and bluntly rounded. **Antirostrum:** Absent to minute and sharply rounded. **Excisura:** Moderately wide, notch absent or very shallow.

***Lethrinus nebulosus*, SSF No. 185.13 PLATE 93**

**DISTRIBUTION:** Indo-West Pacific, plentiful in Natal and reaches Algoa Bay. Attains >75 cm.

**MATERIAL:** 5/26 (7.8-15.78 mm OD, 250-720 mm TL), PEM 14549 (RUSI 31467), 8354, 8194, 7436, 2735; northern Natal and Mauritius; Id. MJS, PCH.

**Otolith shape:** Approximately oval to ovate. **Thickness:** Moderate. **Form:** - **Mesial** convex, - **Lateral** concave. **Dorsal margin:** Rounded; **sculpture**, dentate to irregular. **Ventral margin:** Rounded and crenate to irregular. **Posterior margin:** Sharply rounded and dentate to irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph with low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Broad and bell-shaped, opens onto anterior and ventral wall. **Cauda:** Flexed and deeper near tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1, 1:1.2, 1:1.3, 1:1.4, 1:1.4. **Collum:** Absent. **Crista superior:** Well developed above ostium and caudal tip, ridge-like along most of cauda. **Crista inferior:** Well developed along entire cauda. **Dorsal depression:** Crescent-shaped, moderately deep, area near margin irregular. **Ventral depression:** Absent, may be shallow groove near margin, or margin slightly depressed. **Rostrum:** Large, broad and sharply rounded. **Antirostrum:** Absent to minute and sharply rounded. **Excisura:** Moderately wide, notch very shallow, angle varies.

***Lethrinus rubrioperculatus*, SSF No. 185.15 PLATE 93**

**DISTRIBUTION:** Indo-West Pacific south to Natal. Attains 50 cm.

**MATERIAL:** 1/1 (5.8 mm OD, 197 mm TL), PEM 14524 (RUSI 31462); Mauritius; Id. MJS, PCH.

**Otolith shape:** Oval. **Thickness:** Moderate. **Form:** - **Mesial** strongly convex, - **Lateral** strongly concave. **Dorsal margin:** Rounded; **sculpture**, irregular. **Ventral margin:** Rounded and crenate to irregular. **Posterior margin:** Sharply rounded, crenate to irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph with slightly raised colliculi. **Pseudocolliculum:** Absent. **Ostium:** Short and approximately oval. **Cauda:** Straight with short flexion at posterior. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.3. **Collum:** Absent. **Crista superior:** Well developed above ostium, ridge-like along cauda, well developed after flexion. **Crista inferior:** Well developed along sulcus. **Dorsal depression:** Crescent-shaped following cauda. **Ventral depression:** Absent. **Rostrum:** Broad and sharply rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Moderately wide, notch shallow, angle acute.

***Lethrinus sanguineus*, SSF No. 185.16 PLATE 93**

**DISTRIBUTION:** Western Indian Ocean, south to Sodwana Bay. Attains c. 50 cm.

**MATERIAL:** 2/2 (6.7, 7.4 mm OD, 225, 246 mm TL), PEM 14548, 14547 (RUSI 31432); Mauritius; Id. MJS, PCH.

**Otolith shape:** Rounded-ovate. **Thickness:** Moderate. **Form:** - **Mesial** strongly convex, - **Lateral** concave. **Dorsal margin:** Well rounded; **sculpture**, irregular. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Oblique and blunt with pointed postero-ventral corner and crenate or irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph with low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Broad, moderately long and flared anteriorly. **Cauda:** Straight with deep, sharp flexion. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.4, 1:1.7. **Collum:** Absent. **Crista superior:** Well developed above ostium and after caudal flexion, ridge-like along anterior cauda. **Crista inferior:** Well developed along sulcus. **Dorsal depression:** Elongate, approximately oval, following cauda. **Ventral depression:** Absent. **Rostrum:** Short, broad and blunt. **Antirostrum:** Absent or minute. **Excisura:** Moderately wide, notch very shallow, angle wide.

***Lethrinus variegatus*, SSF No. 185.17 PLATE 93**

**DISTRIBUTION:** Indo-West Pacific, south to Natal. Attains 60 cm.

**MATERIAL:** 4/8 (7.1-8.94 mm OD, 270-395 mm TL), PEM 8530 (RUSI 37469), 4361, 8202 (RUSI 37464), 4622, [8529 (RUSI 37514), 8260 (RUSI 37461), 8253 (RUSI 37462), 8252 (RUSI 37463), 8521 (RUSI 37470)]; Ledsman Shoal; Id. PCH.

**Otolith shape:** Approximately oval to ovate. **Thickness:** Moderate. **Form:** - **Mesial** convex, - **Lateral** concave. **Lateral surface:** Ridge under postero-ventral tip and V-shaped groove under ostium. **Dorsal margin:** Rounded; **sculpture**, irregular. **Ventral margin:** Rounded and crenate to irregular. **Posterior margin:** Rounded with sharply rounded postero-ventral corner, crenate to irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph with low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Elongate flared, dorsal edge of rostrum raised. **Cauda:** Broad, short flexion deepens posteriorly. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.6, 1:1.5, 1:1.2, 1:1. **Collum:** Absent. **Crista superior:** Well developed above ostium and after flexion, ridge-like above cauda. **Crista inferior:** Well developed under entire sulcus. **Dorsal depression:** Elongate above cauda. **Ventral depression:** Absent, very shallow groove near margin. **Rostrum:** Large, broad and sharply rounded. **Antirostrum:** Small and pointed. **Excisura:** Moderately wide, notch shallow, angle acute.



***Monotaxis grandoculis*, SSF No. 185.19 PLATE 93**

**DISTRIBUTION:** Indo-Pacific from Hawaii to Natal. Attains c. 60 cm.

**MATERIAL:** 1/1 (9.5 mm OD, 507 mm TL), PEM 7434; Banga Nek; Id. MJS.

**Otolith shape:** Ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded to flattened; **sculpture**, crenate to irregular. **Ventral margin:** Sinuous to flat and irregular. **Posterior margin:** Oblique, slightly emarginate and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph with very low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Very elongate, approximately rectangular, mainly on elongate rostrum. **Cauda:** Deep and flexed. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1. **Collum:** Absent. **Crista superior:** Well developed above ostium and after caudal flexion, ridge-like above cauda. **Crista inferior:** Moderately well developed under ostium, well developed below cauda. **Dorsal depression:** Elongate. **Ventral depression:** Absent, curved shallow groove meets ventral margin. **Rostrum:** Elongate, tapered and sharply rounded. **Antirostrum:** Very small and rounded. **Excisura:** Wide, notch very shallow, angle wide.

**NEMIPTERIDAE Nelson No. 325**

**Family characteristics:** Although similar to the Sparidae, the two species described here are very different from each other, possibly suggesting variation greater than generic differences. The otoliths are rounded-ovate or ovate to fusiform. Up to at least 7.9 mm OD. Heterosulcoid with ostial openings. Ostium oval or narrow and elongate, cauda straight, flexed near tip ending close to margin. Heteromorph, low colliculi.

**Key**

- 1a. Otolith rounded-ovate; otolith broad; rostrum large and broad; ostium bulbous ventrally . . . . . *Nemipterus bipunctatus* 186.1
- 1b. Otolith ovate to fusiform; otolith relatively narrow; rostrum moderately elongate or elongate; ostium narrow and elongate . . . . . 2
- 2a. Dorsal margin of otolith raised becoming peaked and lobed becoming digitate; cauda slightly flexed with short tip, ends well short of postero-ventral corner; crista superior well developed over ostium, low ridge over cauda . . . . . *Parascolopsis eriomma* 186.3
- 2b. Dorsal margin of otolith slightly rounded and irregular; cauda flexed, tip more elongate, ends close to postero-ventral corner of otolith; crista superior forms distinct, high ridge along ostium and anterior cauda . . . . . *Scolopsis vosmeri* 186.6

***Nemipterus bipunctatus*, SSF No. 186.1 PLATE 93**

**DISTRIBUTION:** Widespread in tropical Indian Ocean and Persian Gulf, south to Delagoa Bay. Attains 25 cm.

**MATERIAL:** 2/2 (7.2, 7.88 mm OD, 184, 212 mm TL), PEM0401, 0400; Durban fish market; Id. GJBR.

**Otolith shape:** Rounded-ovate. **Thickness:** Very thick, especially in middle. **Form:** - Mesial convex, - Lateral concave to flat. **Dorsal margin:** Raised and rounded; **sculpture**, crenate. **Ventral margin:** Well rounded and slightly irregular. **Posterior margin:** Sharply rounded and crenate to irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Approximately oval, ventral wall bulbous, ventral constriction right-angled. **Cauda:** Approximately horizontal, strongly flexed and deep at tip, may be groove from margin to tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.2, 1:1.6. **Collum:** Absent, step

to cauda. **Crista superior:** Well developed over ostium, ridge-like from neck to tip of cauda. **Crista inferior:** Moderately well developed under ostium, well developed along cauda. **Dorsal depression:** Oval, shallow from neck to flexion. **Ventral depression:** Absent, low ridge near margin, may be a groove under ostium, lower ventral area rugose. **Rostrum:** Large, broad and sharply rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Moderately wide, notch shallow, angle wide.

***Parascolopsis eriomma*, SSF No. 186.3 PLATE 93**

**DISTRIBUTION:** Widespread in tropical Indo-West Pacific and Red Sea, south to Delagoa Bay. Attains 25cm.

**MATERIAL:** 4/4 (5.1-8.28 mm OD, c. 140-274 mm TL), 0333H, PEM 15551 (RUSI 42680), 0602H, 15550 (RUSI 42680); Durban fish market, Red Sea, Indian Ocean; Id. TH, BCR, AK.

**Otolith shape:** Ovate becoming fusiform. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly raised may be peaked; **sculpture**, crenate or lobed, becoming digitate. **Ventral margin:** Slightly rounded and crenate. **Posterior margin:** Tapered, becoming oblique and pointed. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, colliculi depressed, margins slightly raised, posterior very indistinct. **Pseudocolliculum:** Absent. **Ostium:** Elongate and narrow, lies mainly along rostrum, V-shaped posteriorly. **Cauda:** Straight initially, slightly flexed at tip which may be joined by groove. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:1.1, 1:1.1, 1:1.1, 1:1.2. **Collum:** Absent, slight step up to cauda. **Crista superior:** Well developed over anterior ostium and after flexion, low ridge from mid-ostium to flexion. **Crista inferior:** Poorly developed under anterior ostium, well developed elsewhere. **Dorsal depression:** Shallow and oval, becoming deep and elongate, margin of otolith may drop away sharply. **Ventral depression:** Absent, crescentic groove present near margin and groove near caudal tip. **Rostrum:** Moderately elongate becoming elongate, sharply rounded or blunt. **Antirostrum:** Small and sharply rounded or pointed. **Excisura:** Wide, notch shallow, angle acute or wide.

***Scolopsis vosmeri*, SSF No. 186.6 PLATE 93**

**DISTRIBUTION:** Widespread in tropical Indo-West Pacific and Persian Gulf, south to Durban. Attains 25 cm.

**MATERIAL:** 2/2 (5.38, 6.4 mm OD, 193, 207 mm TL), PEM4357, 6168 (RUSI 17194); Natal; Id. MJS, PCH.

**Otolith shape:** Approximately ovate to fusiform. **Thickness:** Thick. **Form:** - Mesial convex, - Lateral concave. **Lateral surface:** Very irregular and grooved. **Dorsal margin:** Slightly rounded; **sculpture**, very irregular. **Ventral margin:** Slightly rounded and crenate to slightly irregular. **Posterior margin:** Sharply rounded and dentate to irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, very low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Narrow, deep, lies mainly on rostrum. **Cauda:** Approximately horizontal, strongly flexed with elongate tip, ends near postero-ventral corner. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.4, 1:1. **Collum:** Absent, low step to cauda. **Crista superior:** Ridge-like from ostium to flexion, poorly developed after flexion. **Crista inferior:** Well developed along sulcus. **Dorsal depression:** Narrow and deep, may open onto anterior margin. **Ventral depression:** Absent, groove near margin from caudal tip to area beneath neck. **Rostrum:** Large, becoming elongate, strongly curved laterally, tip sharply rounded. **Antirostrum:** Moderate and pointed. **Excisura:** Wide, notch moderate, angle acute.



**Family characteristics:** Otoliths are large to massive and extremely thick, oblong or oval to rounded or rounded triangular in shape, up to at least 23 mm OD. They are heterosulcoid with characteristic tadpole-shaped sulcus, with the exception of the genus *Johnius*, which has a pit-like caudal tip. Opening either pseudo-ostial, para-ostial or ostial. Heteromorph, colliculi usually very low but margin may be distinctly raised in *Johnius*.

**NOTE:** The taxonomic status of *Argyrosomus hololepidotus* in southern Africa is currently under review by MHG (SFRI). For the purposes of this guide, we append the letters A and B after the name to designate the two forms.

#### Key

- 1a. Otolith approximately triangular; deep, circular pit present in cauda . . . . . 2
- 1b. Otolith oval to circular or triangular; caudal pit absent . . . . . 3
- 2a. Neck triangular, usually flat junction with ostium; ventral groove anterior to pit short; lateral surface with narrow, strong ridge and grooved area . . . . . *Johnius amblycephalus* 199.5
- 2b. Neck narrower, usually with more rounded junction with ostium; ventral groove anterior to pit longer; lateral surface with raised lump, not grooved . . . . . *Johnius dussumieri* 196.6
- 3a. Caudal tip either with narrow dorsal, or narrow dorsal and ventral lobe . . . . . 4
- 3b. Caudal tip narrow, rounded or slightly flared like hockey stick . . . . . 5
- 4a. Otolith rounded triangle; ventral margin keeled to well rounded; cauda straight to slightly flexed; postero-dorsal and ventral lobes at caudal tip . . . . . *Otolithes ruber* 199.7
- 4b. Otolith approximately oval; ventral margin of otolith well rounded; cauda gently flexed; caudal tip with distinct postero-dorsal lobe only . . . . . *Atrubucca nibe* 199.4
- 5a. Otolith oblong-oval; cauda strongly flexed, slightly flared forming a hockey stick shape . . . . . *Argyrosomus thorpei* 199.2
- 5b. Otolith oblong or rounded oval; caudal tip not distinctly flared in hockey stick shape . . . . . 6
- 6a. Otolith rounded oval . . . . . 7
- 6b. Otolith elongate oblong . . . . . 8
- 7a. Dorsal margin of otolith gently lobed; anterior cauda not bulging at neck; postero-dorsal corner of otolith rounded; dorsal depression not wrinkled; lateral surface of otolith nodular but nodules dispersed on surface; a small species . . . . . *Umbrina canariensis* 199.8
- 7b. Dorsal margin of otolith more ragged; anterior cauda slightly bulged just posterior to constrictions; postero-dorsal corner of otolith slightly extended; dorsal depression may be wrinkled; lateral surface of otolith with nodules in tight cluster; attains larger size . . . . . *Umbrina ronchus* 199.9
- 8a. Otolith short, squat and broad posteriorly; ventral lobe of ostium and tip of cauda close to each other . . . . . *Argyrosomus hololepidotus* A 199.1A
- 8b. Otolith elongate oblong; tip of cauda far from ventral lobe of ostium . . . . . 9
- 9a. Neck narrower than cauda; anterior cauda bulges after constrictions of neck; ventral lobe of ostium broad, not extended; otolith relatively narrow, narrows posteriorly; tip of cauda not flared, may narrow . . . . . *Atractoscion aequidens* 199.3

- 9b. Neck not narrower than cauda; ventral lobe of ostium narrow, extended posteriorly; otolith broader, bluntly rounded posteriorly; tip of cauda may be slightly flared but rounded . . . . . *Argyrosomus hololepidotus* B 199.1B

#### *Argyrosomus hololepidotus* A, SSF No. 199.1A PLATE 94

**DISTRIBUTION:** Found in Natal and inshore Cape waters (MHG pers comm). Attains c. 140 cm.

**MATERIAL:** 5/55 (6.0-31.4 mm OD, 141-1348 mm TL), PEM 1706, 5913, 8694, 1700, 5374; southern Cape and Natal; Id. MJS, MHG.

**Otolith shape:** Oval to rectangular or oblong. **Thickness:** Extremely thick in centre. **Form:** - Mesial convex, - Lateral convex. **Lateral surface:** Scattered knobs become fused as postero-central area with growth. **Dorsal margin:** Slightly rounded; **sculpture,** crenate to slightly irregular. **Ventral margin:** Rounded to slightly rounded or emarginate with growth; **sculpture,** crenate to slightly irregular. **Posterior margin:** Slightly rounded becoming blunt and square; **sculpture,** crenate becoming slightly irregular with growth. **Sulcus acusticus:** Para-ostial (c. 8.1 mm OD) becoming pseudo-ostial, heterosulcoid. **Colliculum:** Heteromorph, very low and flat anterior, indented posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Mushroom-shaped, broad postero-ventral lobe. **Cauda:** Initially horizontal, strongly flexed along most of length, recurved, narrowing at tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:0.7, 1:0.8, 1:1, 1:0.9, 1:0.7. **Collum:** Absent. **Crista superior:** Poorly developed over ostium, well developed or low ridge over cauda. **Crista inferior:** Poorly developed under ostium well developed under cauda. **Dorsal depression:** Elongate, follows sulcus shape. **Ventral depression:** Absent. **Rostrum:** Absent or very short, broad and rounded. **Antirostrum:** Absent. **Excisura:** Absent or minute.

#### *Argyrosomus hololepidotus* B, SSF No. 199.1B PLATE 94

**DISTRIBUTION:** Found offshore in Cape waters and off Namibia (MHG pers comm). Attains at least 72 cm.

**MATERIAL:** 5/55 (2.7-21.0 mm OD, 47-715 mm TL), PEM 3574, 3575, 4190 (RUSI 12765), 1820, 5468 (RUSI 15257); off southern and eastern Cape, western Cape and Namibia; Id. MJS, MHG.

**Otolith shape:** Oval becoming rectangular or oblong. **Thickness:** Extremely thick in centre. **Form:** - Mesial convex, - Lateral concave with knob in middle. **Lateral surface:** Small bump in juveniles, postero-central knob becomes larger with growth. **Dorsal margin:** Slightly rounded to flattened; **sculpture,** crenate becoming slightly irregular. **Ventral margin:** Rounded becoming emarginate with growth and crenate becoming slightly irregular with growth. **Posterior margin:** Bluntly rounded and slightly irregular. **Sulcus acusticus:** Para-ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior and posterior colliculi very low. **Pseudocolliculum:** Absent. **Ostium:** Mushroom-shaped with narrow ventral lobe. **Cauda:** Strongly flexed at approximately half its length. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.3, 1:1.1, 1:0.8, 1:0.7, 1:0.7. **Collum:** Absent. **Crista superior:** Poorly developed over ostium, ridge-like over anterior cauda, well developed after flexion. **Crista inferior:** Poorly developed under ostium, moderately well developed along cauda. **Dorsal depression:** Elongate, follows sulcus from ostium to caudal tip, especially in juveniles, dorsal area reduced with growth. **Ventral depression:** Absent. **Rostrum:** If present, very short, broad and rounded. **Antirostrum:** Absent. **Excisura:** If present, minute, notch absent.



***Argyrosomus thorpei*, SSF No. 199.2 PLATE 94**

**DISTRIBUTION:** Known only from Port Elizabeth to the Tugela River; often taken in Natal. Attains 71 cm.

**MATERIAL:** 4/55 (8.4-21.2 mm OD, 165-682 mm TL), PEM 7736 (RUSI 28382), 7739 (RUSI 28382), 7740, 5804; Tugela Bank, Richards Bay and Durban; Id. MJS, PCH.

**Otolith shape:** Oval becoming oblong with growth. **Thickness:** Extremely thick in centre. **Form:** - Mesial convex, - Lateral concave with large cluster of nodules. **Lateral surface:** Nodules near centre. **Dorsal margin:** Flattened; **sculpture**, slightly irregular. **Ventral margin:** Rounded becoming flattened and slightly irregular. **Posterior margin:** Rounded, oblique and slightly irregular. **Sulcus acusticus:** Pseudo-ostial, heterosulcoid. **Colliculum:** Heteromorph, very low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Short mushroom-shaped, broad postero-ventral lobe. **Cauda:** Straight initially, sharply flexed, flaring at tip like hockey stick. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1, 1:1.1, 1:1.2, 1:0.9. **Collum:** Absent, step down to cauda. **Crista superior:** Poorly developed above ostium and after flexion, ridge-like above anterior cauda. **Crista inferior:** Poor to moderately well developed along length of sulcus. **Dorsal depression:** Elongate, follows shape of sulcus. **Ventral depression:** Absent. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

***Atractoscion aequidens*, SSF No. 199.3 PLATE 94**

**DISTRIBUTION:** Along the entire coast, common in Angolan waters and reported from northwest Africa and Australia. Attains 130 cm, 25 kg.

**MATERIAL:** 5/55 (3.6-21.7 mm OD, 71-965 mm TL), PEM 4853, 3662, 3703, 9376, 5791; Cape south coast; Id. MJS.

**Otolith shape:** Oval to oblong. **Thickness:** Very thick in centre. **Form:** - Mesial convex, - Lateral concave with lump near centre. **Lateral surface:** Knobs fuse with growth to form lump. **Dorsal margin:** Slightly rounded becoming flattened; **sculpture**, crenate becoming slightly irregular (>5 mm OD). **Ventral margin:** Slightly rounded becoming flattened with growth, crenate becoming almost entire. **Posterior margin:** Rounded, narrowing posteriorly, crenate becoming approximately entire. **Sulcus acusticus:** Pseudo-ostial, heterosulcoid. **Colliculum:** Heteromorph, low anterior, indented posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Elongate mushroom-shaped. **Cauda:** Straight initially, strongly flexed, narrows at neck and tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.1, 1:0.8, 1:1, 1:0.8, 1:0.9. **Collum:** Absent. **Crista superior:** Poorly developed above ostium and tip, ridge over anterior cauda to flexion. **Crista inferior:** Poor to moderately well developed along sulcus. **Dorsal depression:** Elongate depression from neck to flexion. **Ventral depression:** Absent. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

***Atrobucca nibe*, SSF No. 199.4 PLATE 94**

**DISTRIBUTION:** Natal, India, Taiwan, China and Japan. Attains 30 cm.

**MATERIAL:** 4/40 (6.94-16.8 mm OD, 130-393 mm TL), PEM 0634, 0635, 0239, 9777; Tugela Bank; Id. GJBR, MJS.

**Otolith shape:** Approximately oval. **Thickness:** Very thick in centre. **Form:** - Mesial convex, - Lateral convex with knob in centre. **Lateral surface:** Initially nodular, becoming fused. **Dorsal margin:** Slightly rounded; **sculpture**, crenate anteriorly and slightly irregular. **Ventral margin:** Well rounded and approximately entire. **Posterior margin:** Rounded and approximately entire. **Sulcus acusticus:** Pseudo-ostial, heterosulcoid. **Colliculum:** Heteromorph, slightly raised anterior, indented posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Mushroom-

shaped, bulbous ventrally. **Cauda:** Initially straight with short flexion, distinct dorsal lobe at tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1, 1:1.2, 1:1, 1:1.1. **Collum:** Absent, step down to cauda. **Crista superior:** Poorly developed over ostium and caudal tip, ridge-like over anterior cauda. **Crista inferior:** Poorly developed along sulcus. **Dorsal depression:** Elongate, following sulcus, covers almost entire dorsal area, dorsal area reduced. **Ventral depression:** Absent, may be groove at margin. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

***Johnius amblycephalus*, SSF No. 199.5 PLATE 95**

**DISTRIBUTION:** Indo-West Pacific region, from Algoa Bay northwards. Attains 23 cm.

**MATERIAL:** 6/12 (6.52-12.08 mm OD, 103-225 mm TL), PEM 15322 (RUSI 36867), 15274 & 15273 (both RUSI 36868), 15321, 15319 & 15320, (all RUSI 36867), [15489 (RUSI 40549)]; Tugela Bank; Id. STF, MJS, PCH.

**Otolith shape:** Approximately triangular. **Thickness:** Very thick. **Form:** - Mesial slightly convex, - Lateral convex. **Lateral surface:** With pronounced longitudinal ridge along otolith with grooves, bulbous anteriorly. **Dorsal margin:** Sinuous; **sculpture**, irregular. **Ventral margin:** Sinuous and bulbous and slightly irregular. **Posterior margin:** Narrow, point flexed ventrally, slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, very low anterior colliculum, posterior pit-like and circular with anterior ridge-like margin. **Pseudocolliculum:** Absent. **Ostium:** Broad short and oval, poorly defined. **Cauda:** Neck triangular, strongly flexed with deep and large circular pit. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.9, 1:2.3, 1:1.9, 1:1.7, 1:1.7, 1:1.6. **Collum:** Absent, step down to cauda. **Crista superior:** Poorly developed over ostium, ridge-like over anterior cauda, well developed around pit. **Crista inferior:** Poorly developed under ostium, ridge-like under neck, moderately well developed around pit. **Dorsal depression:** Elongate and narrow, may be small circular pit in antero-dorsal corner. **Ventral depression:** Short groove or depression opens into anterior caudal tip. **Rostrum:** Short, broad and rounded. **Antirostrum:** Absent. **Excisura:** Wide, notch absent.

***Johnius dussumieri*, SSF No. 199.6 PLATE 95**

**DISTRIBUTION:** From East London, South Africa to Singapore. Attains 23 cm.

**MATERIAL:** 5/10 (5.72-10.42 mm OD, 123-185 mm TL), PEM 15278 & 15277 (both RUSI 36869), 15325, 15324 & 15323 (all RUSI 36866); Tugela Bank; Id. STF, MJS, PCH, MEA.

**Otolith shape:** Rounded-triangular. **Thickness:** Very thick. **Form:** - Mesial slightly convex, - Lateral convex. **Lateral surface:** Thick ridge along otolith, not grooved, slightly bulbous anteriorly. **Dorsal margin:** Sinuate; **sculpture**, irregular. **Ventral margin:** Sinuous, bulbous and irregular. **Posterior margin:** Narrow, blunt point, flexed ventrally and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, very low anterior colliculum, posterior pit-like and circular with anterior raised margin. **Pseudocolliculum:** Absent. **Ostium:** Broad, short and oval, poorly defined. **Cauda:** Neck narrow and triangular, strongly flexed with deep large pit. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:2, 1:1.6, 1:1.8, 1:1.1, 1:2.1. **Collum:** Absent, step down to cauda. **Crista superior:** Poorly developed above ostium, ridge-like over anterior cauda, well developed around posterior cauda. **Crista inferior:** Poorly developed along ostium, moderately well developed around cauda. **Dorsal depression:** Elongate, small very shallow pit at antero-dorsal corner. **Ventral depression:** Absent, moderately long groove opens into anterior caudal tip. **Rostrum:** Short, broad



and rounded. **Antirostrum:** Absent. **Excisura:** Wide, notch absent.

### *Otolithes ruber*, SSF No. 199.7 PLATE 95

**DISTRIBUTION:** Indo-West Pacific, extending south to at least Durban. Attains 80 cm.

**MATERIAL:** 7/65 (5.3-15.2 mm OD, 106-405 mm TL), PEM 1722, 1721, 8737, 7737, 7738 & 7749 (both RUSI 28383), 6068, [15271 (RUSI 36878)]; Tugela Bank and Durban; Id. MJS, RvdE, PCH.

**Otolith shape:** Rounded-triangular. **Thickness:** Very thick. **Form:** - Mesial convex, - Lateral convex. **Lateral surface:** Small nodules in juveniles, become fused with growth. **Dorsal margin:** Slightly rounded; **sculpture,** crenate becoming irregular with growth (>6 mm OD). **Ventral margin:** Keeled to well rounded and crenate becoming irregular. **Posterior margin:** Sharply rounded, crenate becoming entire. **Sulcus acusticus:** Para-ostial may be pseudo-ostial, heterosulcoid. **Colliculum:** Heteromorph, very low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Mushroom-shaped, lobed ventrally. **Cauda:** Straight, gently flexed posteriorly with dorsal and ventral lobes at tip. **Ostio-caudal differentiation:** Dorso-ventral constrictions. **Ostium/cauda:** 1:1.2, 1:1.1, 1:1.2, 1:1, 1:1.1, 1:1.2, 1:1.1. **Collum:** Absent, step down to cauda. **Crista superior:** Poorly developed over ostium and at tip, ridge-like over anterior cauda. **Crista inferior:** Well developed along sulcus. **Dorsal depression:** Elongate along length of dorsal area to flexion or tip. **Ventral depression:** Absent. **Rostrum:** Absent or short, broad and rounded. **Antirostrum:** Absent or minute and rounded. **Excisura:** If present, very narrow, notch very shallow.

### *Umbrina canariensis*, SSF No. 199.8 PLATE 95

**DISTRIBUTION:** West African coast from Morocco to the Cape, and in the western Indian Ocean from False Bay to Pakistan. Attains 55 cm.

**MATERIAL:** 7/260 (3.75-13.7 mm OD, 76-368 mm TL), PEM 4122, 4292 & 4203 (both RUSI 12785), 12498 (RUSI 28384), 11594, 14878 (RUSI 35587), 14875 (RUSI 35544), [14876 (RUSI 35546), 14877 (RUSI 35545), 14879, 14880 (all RUSI 35587)]; Cape south coast; Id. MJS, PCH.

**Otolith shape:** Approximately oval or rounded. **Thickness:** Very thick. **Form:** - Mesial convex, - Lateral convex. **Lateral surface:** Dispersed nodules fuse with growth. **Dorsal margin:** Slightly rounded; **sculpture,** crenate (<7 mm OD) becoming irregular. **Ventral margin:** Well rounded, crenate becoming irregular. **Posterior margin:** Rounded becoming blunt, crenate becoming irregular with growth. **Postero-dorsal corner** square or gently rounded. **Sulcus acusticus:** Pseudo-ostial or para-ostial, heterosulcoid. **Colliculum:** Heteromorph, very low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Mushroom-shaped, with dorsal and ventral lobes. **Cauda:** Neck straight, strongly flexed, narrows at tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:0.8, 1:0.9, 1:0.9, 1:0.9, 1:0.9, 1:0.8, 1:0.6. **Collum:** Absent, step down to cauda. **Crista superior:** Poorly developed over anterior ostium and flexion, ridge-like over posterior ostium and anterior cauda. **Crista inferior:** Poorly developed under ostium, moderately well developed along sulcus. **Dorsal depression:** Very shallow and elongate along sulcus. **Ventral depression:** Absent. **Rostrum:** Absent or short, broad and rounded. **Antirostrum:** Absent or minute and rounded. **Excisura:** If present, very narrow, notch very shallow.

### *Umbrina ronchus*, SSF No. 199.9 PLATE 95

**DISTRIBUTION:** Known from the Canary Ids and northwest coast of Africa to the Persian Gulf. Attains 70 cm.

**MATERIAL:** 7/10 (9.2-22.5 mm OD, 270-813 mm TL), PEM 6768, 7715 (RUSI 20114), 2688, 14863 (RUSI 35540), 14865 (RUSI 35536), 5957, 14217, [14864 (RUSI 35534), 14866 (RUSI 35538), 14867 (RUSI 35539)]; Natal and Cape south coast; Id. RvdE, MJS, PCH.

**Otolith shape:** Approximately oval. **Thickness:** Very thick. **Form:** - Mesial convex, - Lateral concave with small cluster of knobs in centre. **Lateral surface:** Tightly clustered nodules, become fused ridge (c. 22 mm OD). **Dorsal margin:** Slightly rounded; **sculpture,** irregular. **Ventral margin:** Well rounded and slightly irregular. **Posterior margin:** Well rounded and irregular. **Postero-dorsal corner** becomes extended with growth. **Sulcus acusticus:** Para-ostial or pseudo-ostial, heterosulcoid. **Colliculum:** Heteromorph, very low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Mushroom-shaped, rounded ventral bulge. **Cauda:** Bulges slightly at neck, strongly flexed, narrows at tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:0.7, 1:0.8, 1:0.7, 1:0.8, 1:0.8, 1:0.8, 1:0.9. **Collum:** Absent, step down to cauda. **Crista superior:** Poorly developed over ostium and caudal tip, low ridge over anterior cauda. **Crista inferior:** Poorly developed along sulcus. **Dorsal depression:** Shallow, elongate from ostium to caudal tip, becoming wrinkled in posterior in large otoliths. **Ventral depression:** Absent. **Rostrum:** Absent or short, broad and rounded. **Antirostrum:** Absent. **Excisura:** Absent or very narrow, notch very shallow.

### MULLIDAE Nelson No. 327

**Family characteristics:** Otoliths are oval-ovate to slightly triangular and small, up to c. 5.2 mm OD. Heterosulcoid with small ostium which may have an excisural pit. Straight or slightly flexed anterior cauda, with ventrally flexed posterior pit close to posterior margin. May be a ventral groove from margin to pit. Openings ostial, or ostio-caudal with growth. Heteromorph with very indistinct colliculi. Crista superior ridge-like at least along anterior cauda. Generally very similar otoliths within this family and extremely large ontogenetic variation with growth.

#### Key

- 1a. Crista inferior not constricted in neck; no step up to cauda from ostium . . . . . 2
- 1b. Crista inferior constricted in neck; step up to cauda from ostium . . . . . 3
- 2a. Rostrum pointed; cauda gently flexed along its length; ventral margin of otolith may be depressed and indented below ostium; crista superior an elongate ridge, reaches midpoint of pit . . . . . *Upeneus vittatus* 196.13
- 2b. Rostrum large, sharply rounded; cauda almost straight but pit sharply flexed; ventral margin under ostium not indented or depressed; crista superior ridge-like, short, just reaching pit . . . . . *Upeneus tragula* 196.12
- 3a. Cauda slightly flexed along its length; ventral margin of pit slightly flexed; ventral margin of otolith approximately flat (>2.7mm OD); dorsal area moderately reduced . . . . . *Mulloides flavolineatus* 196.1
- 3b. Cauda with slightly sinuous dorsal margin; ventral margin of cauda sharply flexed under pit; excisural pit in ostium often present; margins of otolith often become digitate . . . . . *Parupeneus* spp.  
Species in this genus have very similar otoliths with large ontogenetic variation. Specific identifications may be possible when material is compared directly with reference otoliths.

### *Mulloides flavolineatus*, SSF No. 196.1 PLATE 96

**DISTRIBUTION:** Indo-West Pacific and Red Sea; extending to Knysna. Attains 30 cm.



**MATERIAL:** 3/3 (2.6-3.6 mm OD, 96-200 mm TL), PEM 15653, 15643, 14555 (RUSI 31422); Comoro Ids, Mauritius; Id. MJS, PCH.

**Otolith shape:** Oval-ovate. **Thickness:** Thin. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Rounded; **sculpture,** lobed. **Ventral margin:** Approximately flat to slightly rounded and crenate to serrate. **Posterior margin:** Sharply rounded and lobed or slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, extremely indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Slightly flared dorsally and ventrally, ventral wall poorly defined, anterior ostium floor with upward retroflexion may close part of excisura and leave a hole in ostium. **Cauda:** Straight and raised in the anterior horizontal section, ventrally flexed with deep caudal pit. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.6, 1:1.8, 1:2.1. **Collum:** Absent, step up to cauda and down to pit. **Crista superior:** Well developed above anterior ostium, ridge-like to mid-caudal pit, well developed around pit. **Crista inferior:** Poorly developed under ostium, low ridge from neck to pit, poorly developed at tip. **Dorsal depression:** Elongate above horizontal cauda. **Ventral depression:** Absent. **Rostrum:** Moderate or short, broad and rounded. **Antirostrum:** Moderate and sharply rounded. **Excisura:** Small, notch moderate, may be closed, angle varies.

#### *Parupeneus barberinus*, SSF No. 196.3 PLATE 96

**DISTRIBUTION:** Indo-West Pacific south to Mossel Bay. Attains 40 cm.

**MATERIAL:** 4/5 (1.45-3.75 mm OD, 66-255 mm TL), PEM 15448 (RUSI 40566), 15642, 1255H, 1254H; either Madagascar or Bazaruto, Comoro Ids, Eilat; Id. MJS, PCH, TH.

**Otolith shape:** Rounded-ovate. **Thickness:** Thin. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Slightly rounded or flattened becoming raised posteriorly (c. 2.6 mm OD); **sculpture,** lobed and irregular. **Ventral margin:** Slightly rounded and crenate becoming deeply incised and irregular (c. 2.6 mm OD). **Posterior margin:** Bluntly rounded becoming notched and irregular (c. 3.7 mm OD). **Sulcus acusticus:** Ostial (<2.5 mm OD), becoming ostio-caudal (>c. 3.6 mm OD), heterosulcoid. **Colliculum:** Heteromorph, extremely indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Deep, notched and approximately oval, narrowing anteriorly. **Cauda:** Straight becoming sinuous and raised anteriorly, pit deep, posterior margin of larger otoliths eroded. Shallow notch or groove passes through ventral crista of pit. **Ostio-caudal differentiation:** Dorsally constricted principally. **Ostium/cauda:** 1:2.2, 1:1.9, 1:1.5, 1:1.8. **Collum:** Absent, distinct step up to cauda and down to pit. **Crista superior:** Ridge-like from ostium to caudal pit, poorly, becoming moderately well developed around pit (c. 2.6 mm OD). **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Elongate from ostium to pit. **Ventral depression:** Absent, margin depressed, groove from margin to caudal pit. **Rostrum:** Short, broad and bluntly rounded, may be notched. **Antirostrum:** Small and pointed. **Excisura:** Moderate, notch moderate, angle acute.

#### *Parupeneus bifasciatus*, SSF No. 196.4 PLATE 96

**DISTRIBUTION:** Indo-West Pacific south to Sodwana Bay. Attains 30 cm.

**MATERIAL:** 3/3 (2.2-4.5 mm OD, 105-286 mm TL), PEM 15644, 14534 & 14530 (both RUSI 31435); Comoro Ids, Mauritius; Id. MJS, PCH.

**Otolith shape:** Irregularly oval-ovate. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Raised posteriorly; **sculpture,** lobed. **Ventral margin:** Slightly rounded, digitate, notched and irregular. **Posterior margin:** Bluntly rounded and irregular. **Sulcus acusticus:**

Ostial, heterosulcoid. **Colliculum:** Heteromorph, extremely indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Deep, slightly flared dorsally, develops excisural pit. **Cauda:** Deep, slightly raised in anterior section, sharply flexed ventrally with deep pit undercutting ventral area. Ventral groove meets ventral crista of pit. **Ostio-caudal differentiation:** Dorso-ventrally constricted, dorsally principally. **Ostium/cauda:** 1:2.2, 1:1.2, 1:1.1. **Collum:** Absent, step up to cauda and down to pit. **Crista superior:** Moderately well developed over anterior ostium and around pit, ridge-like along horizontal cauda. **Crista inferior:** Moderately well developed under ostium, well developed elsewhere. **Dorsal depression:** Elongate. **Ventral depression:** Absent, margin becomes depressed, ventral groove to caudal pit. **Rostrum:** Moderate, broad and sharply rounded or lobed. **Antirostrum:** Absent. **Excisura:** Moderate, notch absent.

#### *Parupeneus cinnabarinus*, SSF No. 196.5 PLATE 96

**DISTRIBUTION:** Indo-West Pacific, Red Sea south to Transkei. Attains 28 cm.

**MATERIAL:** 1/1 (4.0 mm OD, 227 mm TL), PEM 14528 (RUSI 31468); Mauritius; Id. MJS, PCH.

**Otolith shape:** Approximately oblong and irregular. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Lobed and notched; **sculpture,** very irregular or digitate. **Ventral margin:** Slightly rounded, lobed, notched and irregular. **Posterior margin:** Sharply rounded, oblique and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, very indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Deep with excisural pit. **Cauda:** Anterior, horizontal part slopes down to pit. Pit ventrally flexed and undercuts ventral area. **Ostio-caudal differentiation:** Poorly constricted dorsally and ventrally. **Ostium/cauda:** 1:1.1. **Collum:** Absent, step up to cauda, slope down to pit. **Crista superior:** Ridge-like and sinuous from ostium to caudal pit, moderately well developed around pit. **Crista inferior:** Poorly developed under anterior ostium, well developed under cauda. **Dorsal depression:** Elongate along most of dorsal area. **Ventral depression:** Absent, margin depressed as broad, shallow groove from ostium to pit. **Rostrum:** Large, broad and pointed. **Antirostrum:** Absent. **Excisura:** Moderate, notch absent.

#### *Parupeneus cyclostomus*, SSF No. 196.6 PLATE 96

**DISTRIBUTION:** Indo-West Pacific, Red Sea, southwards to Durban. Attains 48 cm.

**MATERIAL:** 3/5 (3.7-5.1 mm OD, 214-363 mm FL), PEM 14526 (RUSI 31431), 5688, 5687; Sodwana and Mauritius; Id. MJS, PCH.

**Otolith shape:** Oval-ovate. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Flattened, posterior raised and slightly rounded; **sculpture,** lobed and irregular. **Ventral margin:** Slightly rounded, digitate, dentate and irregular. **Posterior margin:** Sharply rounded, oblique and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, colliculi very indistinct. **Pseudocolliculum:** Absent. **Ostium:** Small and narrow with excisural pit. **Cauda:** Anterior section slightly raised, pit moderately deep and ventrally flexed. **Ostio-caudal differentiation:** Slight narrowing dorsally and ventrally. **Ostium/cauda:** 1:1.6, 1:1.7, 1:1.5. **Collum:** Absent, slight step up to cauda and slope to pit. **Crista superior:** Moderately well developed at extremes, ridge-like above cauda. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Elongate along most of dorsal area. **Ventral depression:** Absent, margin depressed. **Rostrum:** Moderate, broad and sharply rounded. **Antirostrum:** Absent or small and sharply rounded. **Excisura:** Moderate, notch very shallow, angle wide.



***Parupeneus indicus*, SSF No. 196.7 PLATE 96**

**DISTRIBUTION:** Indo-West Pacific to Port Alfred. Attains 32 cm.

**MATERIAL:** 1/1 (1.55 mm OD, 69 mm TL), PEM 15444 (RUSI 50462); Madagascar or Bazaruto; Id. MJS, PCH.

**Otolith shape:** Oval-ovate. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Slightly rounded; **sculpture,** crenate. **Ventral margin:** Slightly rounded and crenate. **Posterior margin:** Flat, oblique, sharply rounded and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, colliculi very indistinct. **Pseudocolliculum:** Absent. **Ostium:** Approximately oval, narrow anteriorly and moderately deep. **Cauda:** Straight initially, with ventral lobe and pit. **Ostio-caudal differentiation:** Dorsoventrally slightly constricted. **Ostium/cauda:** 1:1.6. **Collum:** Absent, step up to cauda and down to pit. **Crista superior:** Moderately well developed above anterior ostium and pit, ridge-like elsewhere. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Elongate, lying above anterior cauda. **Ventral depression:** Absent, shallow groove close to margin. **Rostrum:** Short, broad and rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Narrow, notch shallow, angle acute.

***Parupeneus macronema*, SSF No. 196.8 PLATE 96**

**DISTRIBUTION:** Indian Ocean and Red Sea; south to Sodwana Bay. Attains 35 cm.

**MATERIAL:** 5/15 (3.0-3.7 mm OD, 156-243 mm TL), PEM 6487, 15626, 6727, 8247 (RUSI 34150), 6726 (RUSI 28389), [8825 (RUSI 37466)]; Natal, Comoro Ids; Id. MJS, PCH.

**Otolith shape:** Oval-ovate. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Flattened, posterior slightly raised and slightly rounded; **sculpture,** lobed and irregular. **Ventral margin:** Slightly rounded, lobed and crenate. **Posterior margin:** Oblique, bluntly rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, very indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Short and deep. **Cauda:** Deep, anterior straight, only slightly raised, caudal pit moderately deep. **Ostio-caudal differentiation:** Dorsally constricted. **Ostium/cauda:** 1:1.3, 1:2.1, 1:1.9, 1:1.7, 1:1.4. **Collum:** Absent. **Crista superior:** Ridge-like from ostium to pit, moderately well developed around pit. **Crista inferior:** Poorly developed under anterior ostium, well developed elsewhere. **Dorsal depression:** Elongate. **Ventral depression:** Absent, margin may be depressed. **Rostrum:** Moderate, broad and sharply rounded. **Antirostrum:** If present, very small and rounded. **Excisura:** Moderate, notch shallow if present, angle acute.

***Parupeneus pleurostigma*, SSF No. 196.9 PLATE 97**

**DISTRIBUTION:** Indo-West Pacific, south to Delagoa Bay. Attains 25 cm.

**MATERIAL:** 1/1 (3.6 mm OD, 224 mm TL), PEM 9607; ORI; Id. MJS.

**Otolith shape:** Oval-ovate. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Slightly rounded; **sculpture,** lobed and irregular. **Ventral margin:** Slightly rounded and crenate. **Posterior margin:** Oblique and bluntly rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Deep with excisural pit. **Cauda:** Deep, anterior cauda only slightly raised, pit moderately shallow, with steep ventral wall and low-angled dorsal wall. **Ostio-caudal differentiation:** Mainly dorsally constricted. **Ostium/cauda:** 1:1.7. **Collum:** Absent, slight step up to cauda,

slope down to caudal pit. **Crista superior:** Sinuous and ridge-like from ostium to pit, moderately well developed around pit. **Crista inferior:** Well developed along length. **Dorsal depression:** Elongate. **Ventral depression:** Absent. **Rostrum:** Short, broad and bluntly rounded. **Antirostrum:** Moderate and sharply rounded. **Excisura:** Moderate, notch moderate, angle acute.

***Parupeneus rubescens*, SSF No. 196.10 PLATE 97**

**DISTRIBUTION:** Indo-West Pacific, Red Sea, south to Mossel Bay. Attains 42 cm.

**MATERIAL:** 5/16 (1.8-5.2 mm OD, 79-400 mm TL), PEM 10334, 6728 (RUSI 28390), 14853, 14851, 6038 (RUSI 17474); Algoa Bay and vicinity and off Durban; Id. MJS, PCH.

**Otolith shape:** Oval-ovate. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly concave, depressed in centre. **Lateral surface:** Indentation in nucleus in large otoliths. **Dorsal margin:** Slightly rounded; **sculpture,** lobed and irregular. **Ventral margin:** Slightly rounded, crenate, lobed and irregular. **Posterior margin:** Oblique, bluntly rounded and crenate or irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, with low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Deep and flared, may have excisural pit. **Cauda:** Anterior cauda raised, pit deep and sharply flexed. **Ostio-caudal differentiation:** Mainly dorsally constricted. **Ostium/cauda:** 1:1.5, 1:1.3, 1:1.3, 1:1.3, 1:1.2. **Collum:** Absent, step up to cauda, slope to pit. **Crista superior:** Sinuous and ridge-like from ostium to caudal pit, moderately well developed around pit. **Crista inferior:** Poorly developed under anterior ostium, well developed elsewhere. **Dorsal depression:** Elongate and approximately oval. **Ventral depression:** Absent, margin may be depressed. **Rostrum:** Large and broadly rounded. **Antirostrum:** Moderate to small and sharply rounded. **Excisura:** Moderate, notch shallow, angle varied.

***Upeneus tragula*, SSF No. 196.12 PLATE 97**

**DISTRIBUTION:** Indo-West Pacific, south to Durban. Attains 20 cm.

**MATERIAL:** 1/1 (4.0 mm OD, 176 mm TL), PEM 5068 (RUSI 13763); Kenya; Id. PCH.

**Otolith shape:** Ovate. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Flattened and raised posteriorly; **sculpture,** slightly irregular. **Ventral margin:** Slightly rounded and serrate. **Posterior margin:** Sharply rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Narrow and moderately shallow. **Cauda:** Anterior cauda slightly raised, pit moderately shallow, posterior wall poorly defined, ventral wall sinuous, and may have groove to ventral margin. **Ostio-caudal differentiation:** Slightly dorsally constricted. **Ostium/cauda:** 1:1.3. **Collum:** Absent, slight step up to cauda and slight step down to pit. **Crista superior:** Low ridge from ostium along anterior cauda, moderately well developed around pit. **Crista inferior:** Poorly developed under ostium, well developed below cauda but absent at tip. **Dorsal depression:** Elongate and narrow. **Ventral depression:** Absent, margin depressed. **Rostrum:** Large and sharply rounded. **Antirostrum:** Moderate and pointed. **Excisura:** Moderate, notch shallow, angle wide.

***Upeneus vittatus*, SSF No. 196.13 PLATE 97**

**DISTRIBUTION:** Indo-West Pacific, Red Sea and southward to East London. Attains 28 cm.

**MATERIAL:** 4/5 (3.65-4.4 mm OD, 127-185 mm TL), PEM 15453 (RUSI 40570), 14557 (RUSI 31413), 0231, 14556 (RUSI 31398), [15478 (RUSI 40593)]; Mauritius, Tugela mouth and Madagascar or Bazaruto; Id. MJS, PCH, GJBR.



**Otolith shape:** Approximately triangular-ovate. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Crested posteriorly, may be slightly notched in centre; **sculpture,** serrate and irregular. **Ventral margin:** Slightly rounded and crenate. **Posterior margin:** Bluntly rounded and irregular. **Sulcus acusticus:** Ostial, may appear ostio-caudal, heterosulcoid. **Colliculum:** Heteromorph, colliculi very indistinct. **Pseudocolliculum:** Absent. **Ostium:** Narrow, straight ventrally, flared dorsally. **Cauda:** Only slightly raised anteriorly, gently flexed along its length, pit shallow and close to postero-ventral margin. **Ostio-caudal differentiation:** Dorsally constricted. **Ostium/cauda:** 1:2.2, 1:1.8, 1:1.4, 1:1.9. **Collum:** Absent, no step. **Crista superior:** Ridge-like from ostium to mid-caudal pit, poorly developed around pit. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Elongate. **Ventral depression:** Absent, ventral margin may be depressed, particularly under ostium. **Rostrum:** Large and pointed, may have ventral notch under tip. **Antirostrum:** Minute and rounded. **Excisura:** Moderate, notch very shallow, angle wide.

#### MONODACTYLIDAE Nelson No. 328

**Family characteristics:** Otoliths rounded-ovate, up to c.7.5 mm OD, margins crenate. Heterosulcoid with ostial opening. Cauda angled slightly ventrally, slightly flexed near tip, ends near margin. Heteromorph, low and indistinct colliculi.

##### Key

- 1a. Otolith broad and rounded; ostium short and flared; cauda slightly flexed, tip moderately long  
..... *Monodactylus argenteus* 193.1
- 1b. Otolith relatively narrow and elongate; ostium elongate and relatively narrow, lies mainly along rostrum; cauda slightly flexed, tip short . . . *Monodactylus falciformis* 193.2

#### *Monodactylus argenteus*, SSF No. 193.1 PLATE 97

**DISTRIBUTION:** Red sea and Indo-West Pacific including Japan and Australia; extends south to the Breede River (Cape Infante). Attains 25 cm.

**MATERIAL:** 3/5 (2.8-4.5 mm OD, 78-125 mm TL), 1196H, 1158H, 1157H; Red Sea; Id. AD, TH.

**Otolith shape:** Rounded-ovate. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Slightly rounded; **sculpture,** crenate and irregular. **Ventral margin:** Rounded and crenate. **Posterior margin:** Rounded and crenate to irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, very low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Flared, steep, sharply flared dorsal wall. **Cauda:** Angled slightly ventrally, flexed in posterior third. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.4, 1:1.3, 1:1.7. **Collum:** Absent, step up to cauda. **Crista superior:** Ridge-like from neck to flexion, well developed at extremes. **Crista inferior:** Well developed along sulcus. **Dorsal depression:** Oval from neck to flexion. **Ventral depression:** Absent. **Rostrum:** Short, broad and rounded. **Antirostrum:** Absent or small and rounded. **Excisura:** Moderate, notch shallow, angle wide.

#### *Monodactylus falciformis*, SSF No. 193.2 PLATE 97

**DISTRIBUTION:** Red Sea and Indian Ocean south to False Bay. Attains 31 cm.

**MATERIAL:** 4/24 (2.45-7.42 mm OD, 52-207 mm TL), PEM 1243, 1233, 1229, 1381; Knysna and Swartvlei, Cape south coast; Id. HMK, MJS.

**Otolith shape:** Roundly ovate becoming more elongate with growth (c. 6.22 mm OD). **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal mar-**

**gin:** Slightly rounded; **sculpture,** crenate, dentate or irregular. **Ventral margin:** Rounded and crenate. **Posterior margin:** Sharply rounded (c. 2.6 mm OD), becoming more bluntly rounded and crenate or irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, very low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Moderately deep, lies on the rostrum, rostral margin may be raised and uneven. **Cauda:** Slightly angled ventrally, flexed at tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.5, 1:2, 1:1.2, 1:1.3. **Collum:** Absent, step up to cauda in large otoliths. **Crista superior:** Well developed over ostium and caudal flexion, ridge-like along anterior cauda. **Crista inferior:** Poorly developed under ostium, well developed along cauda. **Dorsal depression:** Broad, becoming more elongate with growth. **Ventral depression:** Absent. **Rostrum:** Large, broad and rounded. **Antirostrum:** Moderate and sharply rounded. **Excisura:** Moderate, notch moderate, angle varied.

#### PEMPHERIDIDAE Nelson No. 329

**Family characteristics:** Two species described. Otoliths roundly rhomboidal, up to c. 7.2 mm OD. Heterosulcoid with ostial openings. Ostium wide with bulbous ventral margin, cauda straight initially, flexed near tip. Ventral area very broad, sulcus in upper third of otolith. Ventral groove becomes distinct in large otoliths. Crista superior ridge-like along most of sulcus, crista inferior is well developed. Heteromorph with low anterior, indistinct posterior colliculum. Lateral surface has vertical depression in nucleus area.

##### Key

- 1a. Ventral margin of otolith keeled; ostium width moderate, slightly bulbous ventrally; crista superior is narrow ridge; dorsal area approximately smooth  
..... *Pempheris adusta* 216.2
- 1b. Ventral margin of otolith well rounded; ostium very wide and short, very bulbous ventrally; crista superior is a broad ridge; dorsal area irregular  
..... *Pempheris mangula* 216.3

#### *Pempheris adusta*, SSF No. 216.2 PLATE 98

**DISTRIBUTION:** Indo-West Pacific, south to the Transkei. Attains 17 cm.

**MATERIAL:** 5/18 (3.5-7.18 mm OD, 88-184 mm TL), PEM 2676, 2686, 2674, 2685, 2672; Botla Point; Id. MMS.

**Otolith shape:** Deeply rounded rhomboidal. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Lateral surface:** May be a vertical depression in nucleus region in large otoliths (c. 7 mm OD). **Dorsal margin:** Slightly rounded; **sculpture,** crenate or lobed. **Ventral margin:** Well rounded or keeled, crenate or slightly irregular. **Posterior margin:** Bluntly rounded, crenate or irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Oval, wide and flattened, slightly bulbous ventrally. Anterior colliculum penetrates excisura. **Cauda:** Slightly sinuous and flexed at tip which is pointed. **Ostio-caudal differentiation:** Ventrally constricted, narrows slightly dorsally, more distinct in large otoliths (c. 7 mm OD). **Ostium/cauda:** 1:1.2, 1:1, 1:1, 1:1.2, 1:1.2. **Collum:** Absent. **Crista superior:** Moderately well developed at extremes, low ridge from ostium to flexion. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Approximately oval and shallow. **Ventral depression:** Absent, shallow groove along margin. **Rostrum:** Short, broad and rounded. **Antirostrum:** Minute and sharply rounded. **Excisura:** Moderate, notch very shallow, angle wide.



*Pempheris mangula*, SSF No. 216.3 PLATE 98

**DISTRIBUTION:** Indo-West Pacific, south to at least Porto Amelia; probably occurs in this area. Attains 16 cm.

**MATERIAL:** 1/1 (6.2 mm OD, 170 mm TL), PEM 14265; Comoro Ids; Id. PCH.

**Otolith shape:** Rounded rhomboidal. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral approximately flat. **Lateral surface:** Shallow vertical depression in nucleus region. **Dorsal margin:** Slightly rounded; **sculpture**, lobed or irregular. **Ventral margin:** Well rounded and slightly irregular. **Posterior margin:** Blunt, notched and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior colliculum slightly raised, posterior indistinct. **Pseudocolliculum:** Absent. **Ostium:** Oval, wide and bulbous ventrally. **Cauda:** Straight, sharply flexed and deep at tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.1. **Collum:** Absent. **Crista superior:** Well developed at extremes, broad ridge from ostium to flexion. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Elongate oval. **Ventral depression:** Absent, distinct marginal groove. **Rostrum:** Short, broad and rounded. **Antirostrum:** Minute and rounded. **Excisura:** Moderate, notch very shallow, angle wide.

**CORACINIDAE Nelson No. 333**

**Family characteristics:** Two species described. Otoliths fusiform, up to at least 8.7 mm OD. Heterosulcoid with ostial opening. Rostrum elongate and flexed laterally, otolith twisted along its length. Ostium narrow but flared, lies on rostrum. Cauda deep, flexed at tip. Heteromorph, colliculi reduced and indistinct. Crista superior ridge-like to flexion, crista inferior is ridge-like below cauda.

**Key**

- 1a. Cauda gently flexed, not flared at tip; rostrum down-flexed; dorsal depression deep; posterior margin of otolith oblique or pointed, may be emarginate . . . . . *Coracinus capensis* 187.1
- 1b. Cauda flexed and flared at tip; rostrum straight; dorsal depression shallow; posterior margin of otolith rounded . . . . . *Coracinus multifasciatus* 187.2

*Coracinus capensis*, SSF No. 187.1 PLATE 98

**DISTRIBUTION:** Occurs from southern Angola to Sodwana Bay. Attains 80 cm.

**MATERIAL:** 3/11 (8.0-8.78 mm OD, 413-480 mm TL), PEM 9320, 10328, 1118; Cape south coast; Id. MJS.

**Otolith shape:** Fusiform. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave and slightly twisted along its length. **Dorsal margin:** Approximately flat, raised posteriorly; **sculpture**, lobed and irregular. **Ventral margin:** Slightly rounded to sinuous and irregular. **Posterior margin:** Sharply rounded, oblique or pointed and may be notched, irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, small and indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Deep and flared but narrow, lies mainly on rostrum, rostral dorsal edge raised. **Cauda:** Very gently flexed and very deep. **Ostio-caudal differentiation:** Slight dorso-ventral constrictions. **Ostium/cauda:** 1:0.9, 1:1.1, 1:1. **Collum:** Absent, step to cauda. **Crista superior:** Ridge along entire sulcus except at tip, well developed. **Crista inferior:** Moderately well developed under ostium, ridge-like under cauda. **Dorsal depression:** Deep, elongate to flexion in cauda. **Ventral depression:** Deep, from tip of cauda to neck, narrowing anteriorly. **Rostrum:** Elongate, ventrally flexed and pointed. **Antirostrum:** Narrow, pointed and may be flexed dorsally. **Excisura:** Wide, notch deep, angle acute.

*Coracinus multifasciatus*, SSF No. 187.2 PLATE 98

**DISTRIBUTION:** Occurs mainly from Transkei coast to Madagascar, to Still Bay (west of Mossel Bay). Attains 32 cm.

**MATERIAL:** 4/7 (5.0-6.8 mm OD, 198-289 mm TL), PEM 6736 (RUSI 28391), 0604, 6769, 8804; Natal and Kosi Bay; Id. MJS, RvdE, GJBR, PCH.

**Otolith shape:** Ovate to fusiform. **Thickness:** Moderate. **Form:** - Mesial slightly convex - Lateral concave and slightly twisted along its length. **Dorsal margin:** Slightly rounded to flattened; **sculpture**, slightly irregular. **Ventral margin:** Approximately flat and slightly irregular. **Posterior margin:** Sharply rounded and crenate or irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, colliculi indistinct. **Pseudocolliculum:** Absent. **Ostium:** Narrow, flared ventrally, dorsal margin of rostrum may be raised. **Cauda:** Straight, slightly flexed and flared at tip. **Ostio-caudal differentiation:** Slight dorso-ventral constrictions. **Ostium/cauda:** 1:1.3, 1:1.1, 1:1.3, 1:1.1. **Collum:** Absent, step up to cauda. **Crista superior:** Ridge-like from ostium to flexion, well developed near tip. **Crista inferior:** Well developed under ostium, ridge-like below cauda. **Dorsal depression:** Elongate. **Ventral depression:** Elongate and wide under cauda, widens posteriorly. **Rostrum:** Elongate and pointed or broad and blunt. **Antirostrum:** Large and pointed, may be dorsally flexed. **Excisura:** Wide, notch deep, angle acute.

**KYPHOSIDAE Nelson No. 334**  
(**PARASCORPIDIDAE** in SSF)

**NOTE:** The families Parascorpididae, Scorpididae and Kyphosidae are treated as three families in SSF. In Nelson (1984) they are grouped in the family Kyphosidae. The otoliths of the three families are fairly similar in form.

**Family characteristics:** Only one species. Otoliths fusiform up to c. 14 mm OD, rostrum elongate. Heterosulcoid, ostial opening. Ostium elongate and narrow, cauda straight with slight flexion at tip. Heteromorph with very low and indistinct colliculi. Crista superior ridge-like from ostium to flexion, crista inferior poor or well developed.

*Parascorpius typus*, SSF No. 188.1 PLATE 98

**DISTRIBUTION:** Known only from False Bay to Maputo. Attains 60 cm.

**MATERIAL:** 4/12 (9.4-14.24 mm OD, 306-450 mm TL), PEM 5334, 1653, 11324, 0275; Cape south coast; Id. GJBR, MJS.

**Otolith shape:** Fusiform. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Rounded and raised; **sculpture**, crenate to irregular. **Ventral margin:** Slightly rounded and crenate. **Posterior margin:** Sharply rounded to pointed and lobed or irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, colliculi low and very indistinct. **Pseudocolliculum:** Absent. **Ostium:** Elongate and narrow lying mainly on rostrum. **Cauda:** Long and straight, flexed and deepening at tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.1, 1:1.2, 1:1.3, 1:1.6. **Collum:** Absent, step up to cauda. **Crista superior:** Ridge-like from ostium to flexion, poorly developed becoming well developed (c. 14 mm OD) after flexion. **Crista inferior:** Poorly developed under ostium and tip, well developed under anterior cauda. **Dorsal depression:** Oval. **Ventral depression:** Absent, groove under ostium on rostrum and shallow groove under crista inferior of cauda. **Rostrum:** Elongate and sharply rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Wide, notch moderate, angle acute.

**KYPHOSIDAE Nelson No. 334**

**Family characteristics:** Three species described. Otoliths oblong to fusiform, up to at least 10 mm OD. Heterosulcoid with ostial



opening, ostium slightly flared, not confined to rostrum. Cauda straight with flexed tip, may close near to ventral margin. Crista superior ridge-like from mid-ostium to flexion, crista inferior well developed. Heteromorph with indistinct or low colliculi.

#### Key

- 1a. Otolith oval; ostium filled with rugose colliculum; ridge above dorsal depression . . . . . *Kyphosus vaigiensis* 189.3
- 1b. Otolith oblong to fusiform; ostium with low and indistinct colliculum; no ridge above dorsal depression . . . . . 2
- 2a. Ostium slightly flared ventrally; ventral groove anterior to caudal tip in large otoliths; dorsal margin of otolith flat . . . . . *Kyphosus bigibbus* 189.1
- 2b. Ostium flared dorsally and ventrally; no ventral groove anterior to caudal tip; dorsal margin slightly rounded to flattened . . . . . *Kyphosus cinerascens* 189.2

#### *Kyphosus bigibbus*, SSF No. 189.1 PLATE 98

**DISTRIBUTION:** Red Sea to Japan and Hawaii, south to Cape of Good Hope. Attains 75 cm.

**MATERIAL:** 3/4 (2.5-9.94 mm OD, 87-521 mm TL), PEM 0809 2729, 2728; Sodwana Bay and Cape Recife; Id. MJS, GJBR.

**Otolith shape:** Oblong to fusiform. **Thickness:** Moderate. **Form:** - Medial convex, - Lateral concave. **Dorsal margin:** Flattened; **sculpture**, irregular. **Ventral margin:** Slightly rounded becoming flattened, crenate or slightly irregular with notch under caudal tip in large (>9 mm) otoliths. **Posterior margin:** Sharply rounded and crenate to dentate. **Sulcus acusticus:** Ostial, tip of cauda closes very close to ventral margin, heterosulcoid. **Colliculum:** Heteromorph, low and indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Slightly flared ventrally, lies mainly on rostrum, deeper than cauda and may have a hole at neck. **Cauda:** Straight anteriorly, sharply flexed and deeper at tip. **Ostio-caudal differentiation:** Ventrally constricted, gently curved dorsally. **Ostium/cauda:** 1:1.1, 1:1.3, 1:1.4. **Collum:** Absent, step up to cauda. **Crista superior:** Poor to moderately well developed over ostium and after flexion, low ridge over anterior cauda. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Oval and shallow above anterior cauda anterior to caudal tip. **Ventral depression:** Absent, short shallow groove may run anterior to caudal tip. **Rostrum:** Moderately long, broad and rounded. **Antirostrum:** Absent or moderate and sharply rounded. **Excisura:** Moderate to wide, notch depth and angle varies.

#### *Kyphosus cinerascens*, SSF No. 189.2 PLATE 99

**DISTRIBUTION:** Red Sea, Indo-West Pacific, south to East London. Attains >50 cm.

**MATERIAL:** 2/4 (4.5, 6.98 mm OD, 210, 380 mm TL), PEM 9280 (RUSI 37507), 0421, [5390 (RUSI 15206)]; Durban Market and Cape Recife; Id. GJBR, MJS, PCH.

**Otolith shape:** Oblong. **Thickness:** Moderate. **Form:** - Mesial very convex, - Lateral very concave. **Dorsal margin:** Slightly rounded or flattened; **sculpture**, crenate or irregular. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, colliculi low. **Pseudocolliculum:** Absent. **Ostium:** Flared dorsally and ventrally, short and deep. Rostral edge may be raised. **Cauda:** Straight anteriorly, strongly curved, flared and deep at tip, ending close to ventral margin. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.1, 1:1.4. **Collum:** Absent, step up to cauda. **Crista superior:** Well developed above ostium, ridge-like over anterior cauda, well developed after flexion. **Crista inferior:**

Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Oval and moderately deep above anterior cauda. **Ventral depression:** Absent. **Rostrum:** Short, broad and bluntly rounded. **Antirostrum:** Moderate and rounded. **Excisura:** Moderate, notch moderate, angle acute.

#### *Kyphosus vaigiensis*, SSF No. 189.3 PLATE 99

**DISTRIBUTION:** Indo-Pacific south to Algoa Bay. Attains 60 cm.

**MATERIAL:** 1/1 (7.96 mm OD, 240 mm TL), 0203H; Seal Point; Id. TH.

**Otolith shape:** Oval. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded; **sculpture**, crenate or irregular. **Ventral margin:** Rounded and crenate. **Posterior margin:** Sharply rounded or blunt, crenate or irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, very low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Oval, dorsal margin sinuous and flared, filled with colliculum. **Cauda:** Straight anteriorly, sharply flexed, slightly flared and deeper at tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:0.9. **Collum:** Absent, step up to cauda. **Crista superior:** Well developed above ostium and flexion, ridge-like along anterior cauda. **Crista inferior:** Well developed along sulcus. **Dorsal depression:** Shallow and oval, ridge in mid-dorsal area. **Ventral depression:** Absent, shallow groove from tip to mid-ostium. **Rostrum:** Moderate, broad and sharply rounded. **Antirostrum:** Minute and rounded. **Excisura:** Moderate, notch extremely shallow, angle wide.

#### KYPHOSIDAE Nelson No. 334 (SCORPIDIDAE in SSF)

**Family characteristics:** A single species described. Otoliths ovate to oblong/fusiform, to 8.3 mm OD. Heterosulcoid with ostial opening. Ostium elongate. Cauda becomes straighter anteriorly with growth but flexed at tip, cauda shallow compared to previous two families. Heteromorph, colliculi low and indistinct. Crista superior ridge-like over anterior cauda, crista inferior is poor to well developed.

#### *Neoscopsis lithophilus*, SSF No. 190.1 PLATE 99

**DISTRIBUTION:** False Bay to southern Mozambique in shallow rocky areas. Attains 50 cm.

**MATERIAL:** 4/15 (1.5-8.3 mm OD, 45-408 mm TL), PEM 11992, (RUSI 34122), 5920, 6649, 4936, [8721 (RUSI 37424)]; Natal and southern Cape coast; Id. RvdE, MJS, PCH.

**Otolith shape:** Ovate becoming approximately oblong/fusiform. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Rounded becoming flattened; **sculpture**, irregular. **Ventral margin:** Sharply rounded or flattened and crenate or irregular. **Posterior margin:** Rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, colliculi low and indistinct. **Pseudocolliculum:** Absent. **Ostium:** Short, becoming elongate lying mainly on rostrum, may have hole in ostium. **Cauda:** Gently flexed (<2 mm OD), becoming straight and flexed at poorly defined tip (c. 5 mm OD). **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.3, 1:1.1, 1:1.1, 1:1.2. **Collum:** Absent, step up to cauda. **Crista superior:** Moderately well developed above ostium, ridge-like above anterior cauda, poorly developed after flexion. **Crista inferior:** Moderately well developed, may be well developed under flexion in large otoliths (>7 mm). **Dorsal depression:** Shallow, elongate and oval. **Ventral depression:** Absent, may be a groove parallel with flexed tip. **Rostrum:** Large, elongate and sharply rounded. **Antirostrum:** Very small or small and rounded. **Excisura:** Moderate to wide, notch shallow, angle acute.



## EPHIPPIDIDAE Nelson No. 335

**Family characteristics:** Three species described. Otoliths ovate or oblong/fusiform, up to at least 7.8 mm OD. Heterosulcoid, with ostial opening, lying mainly along rostrum with raised dorsal edge. Cauda straight, flexed near tip. Heteromorph with low, or indistinct colliculi.

**NOTE:** Because of previous confusion in the taxonomy of this family in this region, the specific identification of some otoliths in the collections is uncertain. A comparison of a recently acquired *Platax pinnatus* (PEM 15402) with material previously in the collection suggests that three pairs of otoliths belong to this species whilst the rest are tentatively placed in *Platax orbicularis* at present. This needs confirmation, as there are three species in the genus *Platax* in this region.

### Key

- 1a. Dorsal margin of otolith flat; otolith narrow;  
ventral margin of ostium sinuous . . . . . *Platax orbicularis* 192.1
- 1b. Dorsal margin of otolith slightly rounded or raised;  
ventral margin of ostium straight or slightly bulged . . . . . 2
- 2a. Cauda flexed; ostium with straight ventral margin;  
dorsal depression shallow . . . . . *Platax pinnatus* 192.2
- 2b. Cauda sharply flexed; ventral margin of ostium bulbous  
anterior to neck; dorsal depression deep . . . . . *Tripteronodon orbis* 192.4

### *Platax orbicularis*, SSF No. 192.1 PLATE 99

**DISTRIBUTION:** Indo-West Pacific, south to Knysna. Attains 30 cm.

**MATERIAL:** 2/2 (4.9, 6.2 mm OD, 155, 227 mm TL), PEM 6600, 6459; ORI.

**Otolith shape:** Oblong to fusiform. **Thickness:** Moderately thin. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Flattened; **sculpture**, crenate to irregular. **Ventral margin:** Slightly rounded and crenate to irregular. **Posterior margin:** Rounded and crenate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low posterior, indistinct anterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Lies mainly on rostrum, sinuous ventral margin, dorsal margin of rostrum uneven and raised. **Cauda:** Straight, flexed and flared at tip with deep ventral edge. **Ostio-caudal differentiation:** Slight ventral constriction. **Ostium/cauda:** 1:0.7, 1:0.7. **Collum:** Absent. **Crista superior:** Ridge-like to flexion, poorly developed posteriorly. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Oval, shallow. **Ventral depression:** Absent. **Rostrum:** Elongate and rounded or pointed. **Antirostrum:** Moderate and sharply rounded. **Excisura:** Wide, notch shallow, angle wide.

### *Platax pinnatus*, SSF No. 192.2 PLATE 99

**DISTRIBUTION:** Indo-West Pacific south to at least to Natal and Durban, juveniles to the eastern Cape. Attains 30 cm.

**MATERIAL:** 3/4 (3.28-7.8 mm OD, 103-315 mm TL), PEM 0821, 15402 (RUSI 40601), 9633; ORI, Swartkops and Madagascar; Id. MJS, PCH.

**Otolith shape:** Ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Flattened or slightly raised posterior corner; **sculpture**, irregular. **Ventral margin:** Slightly rounded and crenate or irregular. **Posterior margin:** Blunt or oblique, may be notched, lobed to irregular or crenate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low, reduced colliculi. **Pseudocolliculum:** Absent. **Ostium:** Lies mainly on rostrum with straight ventral margin, dorsal margin of rostrum raised and uneven. **Cauda:** Straight

initially, flexed near tip and deep. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:1.1, 1:1.1, 1:0.8. **Collum:** Absent. **Crista superior:** Well developed to ridge-like from ostium to mid-cauda, poorly developed after flexion. **Crista inferior:** Poorly developed under ostium, well developed along cauda. **Dorsal depression:** Shallow and oval. **Ventral depression:** Absent, may be a shallow groove under neck of sulcus. **Rostrum:** Large and bluntly angled or sharply rounded. **Antirostrum:** Short, broad and rounded or squared. **Excisura:** Wide, notch shallow, angle acute or wide

### *Tripteronodon orbis*, SSF No. 192.4 PLATE 99

**DISTRIBUTION:** Kenya south to Algoa Bay. Attains 50 cm.

**MATERIAL:** 1/1 (5.82 mm OD, 220 mm TL), PEM 0637; ORI; Id. RvdE.

**Otolith shape:** Oblong-ovate. **Thickness:** Moderately thin. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Flattened or slightly rounded; **sculpture**, crenate to lobed. **Ventral margin:** Slightly rounded and crenate. **Posterior margin:** Rounded and crenate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, slightly raised colliculi. **Pseudocolliculum:** Absent. **Ostium:** Lies mainly along rostrum, ventral edge of ostium irregular, bulges anterior to neck and dorsal rostral edge raised and irregular. **Cauda:** Moderately deep, sharply flexed, flared at flexion, tip pointed. **Ostio-caudal differentiation:** Ventrally constricted, curved dorsally. **Ostium/cauda:** 1:0.8. **Collum:** Absent, slight step up to cauda. **Crista superior:** Narrow ridge from ostium to flexion, moderately well developed after flexion. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Oval and moderately deep. **Ventral depression:** Absent. **Rostrum:** Long, broad and rounded. **Antirostrum:** Moderate and pointed. **Excisura:** Wide, notch moderate, angle acute.

## EPHIPPIDIDAE Nelson No. 335 (DREPANIDAE in SSF)

**Family characteristics:** Single species described. Otoliths similar to Ephippididae of SSF, although rostrum shorter and otoliths broader in Drepanidae. Otoliths oval to ovate, up to at least 9.7 mm OD. Heterosulcoid with ostial opening, ostium relatively short and broad, rostrum blunt and rounded. Cauda straight, flexed and flared near tip. Heteromorph, colliculi low.

### *Drepane longimanus*, SSF No. 195.1 PLATE 99

**DISTRIBUTION:** Tropical Indo-West Pacific south to East London. Attains 40 cm.

**MATERIAL:** 7/14 (3.45-9.7 mm OD, 83-320 mm TL), PEM 15288 & 15287 (both RUSI 36874), 0598, 15286 (RUSI 36874), 1688, 1687, 5469 (RUSI 15262); Swartkops estuary and Natal; Id. MJS, PCH, MEA, RvdE.

**Otolith shape:** Oval to ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded to flattened; **sculpture**, irregular. **Ventral margin:** Rounded becoming notched under caudal tip (c. 7.6 mm OD), crenate to irregular. **Posterior margin:** Rounded and crenate to irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, slightly raised colliculi. **Pseudocolliculum:** Absent. **Ostium:** Broad, dorsal rostral edge very uneven. **Cauda:** Approximately straight, narrows at mid-point, flaring towards flexed tip, ending close to ventral margin. **Ostio-caudal differentiation:** Ventrally constricted, curved dorsally. **Ostium/cauda:** 1:1.3, 1:1.3, 1:1.4, 1:0.9, 1:1, 1:1; 15287 damaged. **Collum:** Absent. **Crista superior:** Ridge-like from ostium to flexion, well developed at tip. **Crista inferior:** Well developed along sulcus. **Dorsal depression:** Oval. **Ventral depression:** Absent, may be a shallow, wide groove close to margin. **Rostrum:** Short, broad and



rounded. **Antirostrum:** Small and pointed or rounded. **Excisura:** Moderately wide, notch shallow, angle wide.

### CHAETODONTIDAE Nelson No. 338

**Family characteristics:** Otoliths oval-ovate and small, to c. 5.4 mm OD. Heterosulcoid with ostial opening, cauda angled and usually sinuous, tip often ends near margin. Ostium often reduced and narrow, mainly on the margin of the rostrum. Heteromorph, colliculi very low to extremely indistinct, may be crystalline. The otoliths of these species are very similar.

#### Key

- 1a. Rostrum pointed; cauda horizontal or sinuous, flexed and deep at tip; ventral margin of ostium poorly defined . . . . . *Heniochus* spp. 205.22, 205.24
- 1b. Rostrum rounded or sharply rounded; cauda angled and sinuous; ostium often reduced, lies mainly on rostrum . . . . . 2
- 2a. Sulcus sinuous and angled at 45°; posterior margin of otolith blunt, oblique and crenate; ostium broad and short with its ventral margin very poorly defined . . . . . *Hemitaenichthys zoster* 205.21
- 2b. Sulcus sinuous and slightly angled; posterior margin of otolith rounded, may be notched; ostium narrow: *Chaetodon* spp. 205.1 - 205.19 and *Forcipiger flavissimus* 205.20

#### *Chaetodon auriga*, SSF No. 205.1 PLATE 100

**DISTRIBUTION:** Tropical Indo-Pacific from South Africa and Red Sea to Hawaiian Ids and Australia; extends south on this coast to Mossel Bay. Attains 20 cm.

**MATERIAL:** 4/17 (2.5-4.5 mm OD, 62-165 mm TL), PEM 7699, 6619 (RUSI 28392), 6428, 8658 (RUSI 37499), [6613 & 6614 (RUSI 28392)]; Natal; Id. MJS, PCH.

**Otolith shape:** Rounded-ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral strongly concave. **Dorsal margin:** Rounded; **sculpture,** irregular. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Rounded and crenate or irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, colliculi very reduced and indistinct. **Pseudocolliculum:** Absent. **Ostium:** Very reduced, narrow and deep, fringing rostrum. **Cauda:** Angled ventrally, slightly sinuous, dorsal wall steep, sharply flexed posteriorly. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:1.4, 1:1.3, 1:1.6, 1:2.2. **Collum:** Absent. **Crista superior:** Well developed above ostium and after flexion, ridge-like over anterior cauda. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Oval. **Ventral depression:** Absent. **Rostrum:** Short and broad or tapering and sharply rounded to pointed. **Antirostrum:** Small, pointed with slight dorsal curve. **Excisura:** Wide, notch shallow, angle wide.

#### *Chaetodon blackburnii*, SSF No. 205.3 PLATE 100

**DISTRIBUTION:** Mauritius, Mozambique, south to Bashee River. Attains 12 cm.

**MATERIAL:** 4/17 (1.6-4.0 mm OD, 45-115 mm TL), PEM 9282, 6003, 6125 (RUSI 17188), 7700 (RUSI 28393), [8661-8663 (RUSI 37454), 6759 (RUSI 28393)]; Durban; Id. MJS, PCH.

**Otolith shape:** Approximately oblong-ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Rounded becoming raised; **sculpture,** irregular. **Ventral margin:** Rounded or slightly rounded and slightly irregular. **Posterior margin:** Rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, very indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Deeper than cauda, small, lies mainly on rostrum. **Cauda:** Angled ventrally, slightly sinuous,

sharply flexed near tip. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:1.7, 1:1.4, 1:1.3, 1:1.4. **Collum:** Absent. **Crista superior:** Well developed above anterior ostium and after flexion, becoming ridge-like along cauda to flexion. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Oval. **Ventral depression:** Absent. **Rostrum:** Moderate, broad and rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Wide, notch shallow, angle wide.

#### *Chaetodon dolosus*, SSF No. 205.4 PLATE 100

**DISTRIBUTION:** Known only from east African coast and Mauritius, south to Xora River. Attains 15 cm.

**MATERIAL:** 3/5 (3.45-4.2 mm OD, 111-133 mm TL), PEM 4614, 2870, 4370; Ledsman Shoal and Sodwana Bay, Id. PCH, GJBR.

**Otolith shape:** Oval-ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Raised and peaked; **sculpture,** irregular. **Ventral margin:** Rounded and irregular. **Posterior margin:** Sharply rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, colliculi low, may be crystalline. **Pseudocolliculum:** Absent. **Ostium:** Small and deep, dorsal edge of rostrum may be raised. **Cauda:** Angled ventrally, slightly sinuous, sharply flexed near tip. **Ostio-caudal differentiation:** Ventrally or dorso-ventrally constricted. **Ostium/cauda:** 1:1.6, 1:1.8, 1:1.7. **Collum:** Absent, may be step up to cauda. **Crista superior:** Well developed over anterior ostium and after flexion, broad ridge over anterior cauda. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Oval. **Ventral depression:** Absent, margin under caudal tip may be depressed. **Rostrum:** Short, broad and sharply rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Wide, notch shallow, angle wide.

#### *Chaetodon falcula*, SSF No. 205.5 PLATE 100

**DISTRIBUTION:** Indian Ocean from Africa to Indonesia south to Delagoa Bay. Attains 20 cm.

**MATERIAL:** 1/1 (2.1 mm OD, 44 mm TL), PEM 7697 (RUSI 28394); ORI; Id. PCH.

**Otolith shape:** Oval-ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral slightly concave. **Dorsal margin:** Rounded; **sculpture,** irregular. **Ventral margin:** Well rounded and crenate to irregular. **Posterior margin:** Rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Flared dorsally and ventrally, deeper than cauda. **Cauda:** Short, sharply flexed, ventral walls steep. **Ostio-caudal differentiation:** Dorso-ventrally slightly curved. **Ostium/cauda:** 1:1.3. **Collum:** Absent, slight step up to cauda. **Crista superior:** Well developed at extremes, ridge-like along anterior cauda. **Crista inferior:** Well developed along sulcus. **Dorsal depression:** Oval and deep. **Ventral depression:** Absent. **Rostrum:** Short, broad and sharply rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Moderately wide, notch shallow, angle acute.

#### *Chaetodon guttatissimus*, SSF No. 205.6 PLATE 100

**DISTRIBUTION:** Indian Ocean and Red Sea; south to Durban. Attains 12 cm.

**MATERIAL:** 4/10 (3.2-3.7 mm OD, 88-112 mm TL), PEM 6621 & 6602 (both RUSI 28395), 6126 (RUSI 17189), 6601; ORI, Durban; Id. MJS, PCH.

**Otolith shape:** Oval-ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral slightly concave. **Dorsal margin:** Raised, peaked; **sculpture,** irregular. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Small may be very reduced and deep.



**Cauda:** Angled ventrally, sinuous and sharply flexed at tip. **Ostio-caudal differentiation:** Dorso-ventrally or ventrally constricted. **Ostium/cauda:** 1:1.7, 1:1.6, 1:1.6, 1:1.5. **Collum:** Absent, slight step up to cauda. **Crista superior:** Well developed at extremes, ridge-like over anterior cauda. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Oval and deep. **Ventral depression:** Absent, margin may be depressed. **Rostrum:** Short, broad and rounded or sharply rounded. **Antirostrum:** Small and pointed or rounded in smaller otoliths. **Excisura:** Moderately wide, notch shallow, angle varies.

#### *Chaetodon kleinii*, SSF No. 205.7 PLATE 100

**DISTRIBUTION:** Red Sea and Indian Ocean to central Pacific; south to Coffee Bay. Attains 15 cm.

**MATERIAL:** 4/12 (1.9-3.75 mm OD, 60-113 mm TL), PEM4618, 4371, 6620 (RUSI 28396), 2810, [8214 (RUSI 37442)]; Sodwana Bay and Natal; Id. GJBR, MJS, PCH.

**Otolith shape:** Oval-ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Rounded to slightly raised; **sculpture**, irregular. **Ventral margin:** Rounded and irregular. **Posterior margin:** Rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, slightly raised anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Narrow along rostrum, rostrum dorsal margin may be raised. **Cauda:** Angled ventrally, sinuous, flexed near tip and ends near ventral margin. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:1.5, 1:1.3, 1:1.4, 1:1.3. **Collum:** Absent. **Crista superior:** Broad ridge from ostium to flexion, thereafter well developed. **Crista inferior:** Well developed along sulcus. **Dorsal depression:** Narrow and deep. **Ventral depression:** Absent. **Rostrum:** Elongate, moderately broad and sharply rounded. **Antirostrum:** Small and pointed. **Excisura:** Moderately wide, notch shallow, angle varies.

#### *Chaetodon lunula*, SSF No. 205.9 PLATE 101

**DISTRIBUTION:** South Africa to the Hawaii, Japan and Australia, south to East London. Attains 19 cm.

**MATERIAL:** 3/11 (3.4-5.4 mm OD, 122-200 mm TL), PEM9327, 6616, 6597; ORI and PEO; Id. MJS.

**Otolith shape:** Oval-ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded and emarginate anteriorly; **sculpture**, slightly irregular. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Rounded, notched near postero-ventral corner, slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Very deep, reduced and narrow, lies along rostrum. **Cauda:** Ventrally angled, sinuous and flexed near tip, ends near margin. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.5, 1:1.5, 1:1.7. **Collum:** Absent. **Crista superior:** Well developed or ridge-like over anterior ostium, ridge-like to flexion, well developed thereafter. **Crista inferior:** Poorly developed under ostium, moderately well developed under cauda. **Dorsal depression:** Oval. **Ventral depression:** Absent. **Rostrum:** Broad, tapers anteriorly and pointed. **Antirostrum:** Small and pointed, may have dorsal retroflexion. **Excisura:** Moderately wide, notch shallow, angle wide.

#### *Chaetodon madagaskariensis*, SSF No. 205.10 PLATE 101

**DISTRIBUTION:** Indian Ocean from east coast of Africa to Christmas Is., also Madagascar, Mauritius, south to Port Elizabeth. Attains 13 cm.

**MATERIAL:** 3/21 (3.2-4.0 mm OD, 96-109 mm TL), PEM 6124 (RUSI 17192), 6752 (RUSI 28397), 6751, [8636-8639 and 8794 (RUSI 37486)]; Natal; Id. MJS, PCH.

**Otolith shape:** Oval-ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Raised and peaked; **sculpture**, irregular. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Rounded and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Reduced, lies along rostrum, rostral dorsal margin may be raised and irregular. **Cauda:** Angled ventrally, sinuous, flexed near tip, ending near margin. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.6, 1:1.1, 1:1.7. **Collum:** Absent, step to cauda. **Crista superior:** Ridge-like from ostium to flexion, well developed after flexion. **Crista inferior:** Poorly developed under ostium, moderately well developed under cauda. **Dorsal depression:** Oval and moderately deep. **Ventral depression:** Absent, margin may be depressed below cauda. **Rostrum:** Moderate, broad and sharply rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Moderately wide, notch shallow, angle wide.

#### *Chaetodon marleyi*, SSF No. 205.11 PLATE 101

**DISTRIBUTION:** Endemic to southern Africa from Lamberts Bay (western Cape) to Delagoa Bay. Attains 15 cm.

**MATERIAL:** 4/13 (2.4-4.6 mm OD, 49-112 mm TL), PEM 5319, 4058, 10331, 15204; between Cape Recife and Schoenmakerskop; Id. MJS.

**Otolith shape:** Oblong-ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral slightly concave. **Dorsal margin:** Rounded; **sculpture**, lobed and irregular. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Elongate, rostral edge slightly raised and irregular. **Cauda:** Narrow, long and sinuous, slightly angled ventrally and slightly flexed near tip. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:1.2, 1:1.2, 1:1.2, 1:1.5. **Collum:** Absent. **Crista superior:** Ridge from ostium to flexion, well developed thereafter. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Narrow, oval and shallow. **Ventral depression:** Absent. **Rostrum:** Moderate, broad and sharply rounded. **Antirostrum:** Minute and rounded. **Excisura:** Moderately wide, notch very shallow, angle wide.

#### *Chaetodon melannotus*, SSF No. 205.12 PLATE 101

**DISTRIBUTION:** Indo-Pacific and Red Sea, south to Durban. Attains 15 cm.

**MATERIAL:** 2/2 (2.0, 2.75 mm OD, 45, 78 mm TL), PEM 7695 (RUSI 28398), 0444H; ORI and Red Sea; Id. TH, ABT, MJS, PCH.

**Otolith shape:** Oval-ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Lateral surface:** May have a pit in nucleus region. **Dorsal margin:** Rounded; **sculpture**, irregular. **Ventral margin:** Rounded and crenate or irregular. **Posterior margin:** Rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, extremely indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Very reduced and narrow, slightly deeper than cauda. **Cauda:** Angled ventrally, sinuous and flexed, hooked at tip. **Ostio-caudal differentiation:** Slight dorsal and ventral constrictions. **Ostium/cauda:** 1:1.7, 1:1.6. **Collum:** Absent, step to cauda. **Crista superior:** Ridge-like from ostium to flexion, well developed thereafter. **Crista inferior:** Well developed along cauda. **Dorsal depression:** Oval. **Ventral depression:** Absent. **Rostrum:** Small, broad and rounded



or sharply rounded. **Antirostrum:** Small and rounded. **Excisura:** Moderately wide, notch shallow, angle varies.

***Chaetodon meyeri*, SSF No. 205.13 PLATE 101**

**DISTRIBUTION:** Indo-Pacific; south to Durban. Attains 17 mm.  
**MATERIAL:** 2/2 (2.8, 4.6 mm OD, 62, 159 mm TL), PEM 11315, 6655 (RUSI 28399); ORI; Id. MJS, PCH.

**Otolith shape:** Oval-ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Peaked and emarginate anteriorly; **sculpture**, irregular. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Blunt or sharply rounded and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Very deep, lying along rostrum, dorsal rostral edge raised. **Cauda:** Ventrally angled, sinuous, flexed at tip and ends close to margin. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.6, 1:1.4. **Collum:** Absent, step up to cauda. **Crista superior:** Distinct ridge from ostium to flexion, well developed thereafter. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Narrow and elongate. **Ventral depression:** Absent, margin may be depressed under caudal tip. **Rostrum:** Moderate, broad and rounded or sharply rounded. **Antirostrum:** Very small or moderate and pointed. **Excisura:** Moderately wide, notch moderately shallow, angle varied.

***Chaetodon mitratus*, Günther, 1860 SSF No. 205.—  
PLATE 101**

**DISTRIBUTION:** Collected from Mauritius, unknown from South Africa. Attains at least 10 cm.

**MATERIAL:** 1/1 (3.2 mm OD, 100 mm TL), PEM 14565 (RUSI 31443); Mauritius; Id. MJS, PCH.

**Otolith shape:** Oval-ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Raised and rounded; **sculpture**, approximately entire. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Rounded and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, extremely indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Deep, narrow, lies mainly along rostrum. **Cauda:** Angled ventrally, sinuous, flexed near tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.8. **Collum:** Absent. **Crista superior:** Ridge-like from ostium to flexion, well developed after flexion. **Crista inferior:** Well developed along sulcus. **Dorsal depression:** Elongate from antirostrum to flexion. **Ventral depression:** Absent. **Rostrum:** Short, broad and pointed. **Antirostrum:** Very short and sharply rounded. **Excisura:** Moderately wide, notch moderate, angle acute.

***Chaetodon trifascialis*, SSF No. 205.14 PLATE 101**

**DISTRIBUTION:** Red Sea and Indo-Pacific from Africa to Hawaii; south to the Tugela River. Attains 17 cm.

**MATERIAL:** 3/3 (3.65-3.8 mm OD, 123-140 mm TL), 0987H, 0984H, PEM 8591 (RUSI 37447); Durban, Gulf of Aqaba; Id. PCH, AB, TH.

**Otolith shape:** Oval-ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Raised and peaked; **sculpture**, irregular. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Rounded and irregular, notch close to ventral margin. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, with low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Very reduced and deep, moderately narrow, dorsal margin of rostrum very irregular. **Cauda:** Slightly angled ventrally, flexion either moderate or right-angled, tip poorly defined. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:1.5, 1:1.4, 1:1.6. **Collum:** Absent, step up to

cauda. **Crista superior:** Ridge-like from ostium to flexion, well developed after flexion, poorly developed at tip. **Crista inferior:** Poorly developed at extremes, well developed under cauda. **Dorsal depression:** Elongate and narrow. **Ventral depression:** Absent. **Rostrum:** Elongate, broad and sharply rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Moderately wide, notch shallow or moderate, angle wide.

***Chaetodon trifasciatus*, SSF No. 205.15 PLATE 101**

**DISTRIBUTION:** Indo-Pacific to South Africa (Kosi Bay) to Hawaii. Attains 15 cm.

**MATERIAL:** 1/3 (2.7 mm OD, 60 mm TL), PEM 0091; PEO; Id. GJBR.

**Otolith shape:** Oval-ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded; **sculpture**, crenate or irregular. **Ventral margin:** Rounded and irregular. **Posterior margin:** Rounded and crenate or irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Deep and reduced. **Cauda:** Angled ventrally, slightly sinuous and slightly flexed at tip. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:1.8. **Collum:** Absent, step up to cauda. **Crista superior:** Ridge-like from ostium to flexion, well developed after flexion. **Crista inferior:** Well developed along sulcus. **Dorsal depression:** Oval and deeper anteriorly. **Ventral depression:** Absent. **Rostrum:** Small, broad and sharply rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Moderately wide, notch shallow, angle wide.

***Chaetodon unimaculatus*, SSF No. 205.16 PLATE 102**

**DISTRIBUTION:** Indian Ocean from Africa to Indonesia; south to Port Alfred. Attains 18 cm.

**MATERIAL:** 3/13 (3.6-5.6 mm OD, 114-166 mm TL), PEM 8635 (RUSI 37488), 6744 (RUSI 28450), 9601 (RUSI 37501), [9634 & 9635 (both RUSI 37501), 8633, 8634 & 8266 (all 3 RUSI 37488)]; ORI and Kosi Bay; Id. MJS, PCH.

**Otolith shape:** Oval-ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly raised and peaked; **sculpture**, irregular. **Ventral margin:** Rounded and irregular. **Posterior margin:** Rounded, notched and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, very indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Reduced, narrow and deep, lies along rostrum, dorsal rostral margin irregular. Ventral margin becomes more sinuous (>5 mm OD). **Cauda:** Angled ventrally, slightly sinuous and flexed near tip, ending moderately far from margin. **Ostio-caudal differentiation:** Slight dorso-ventral constrictions. **Ostium/cauda:** 1:1.4, 1:1.7, 1:1.2. **Collum:** Absent, step up to cauda. **Crista superior:** Ridge-like from ostium to flexion, well developed thereafter. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Oval, reduced and anteriorly located in large otoliths (>5 mm OD). **Ventral depression:** Absent. **Rostrum:** Moderate, broad and pointed. **Antirostrum:** Small and pointed. **Excisura:** Moderately wide, notch shallow, angle wide.

***Chaetodon vagabundus*, SSF No. 205.17 PLATE 102**

**DISTRIBUTION:** Indo-Pacific and Red Sea; south to Durban. Attains 15 cm.

**MATERIAL:** 3/4 (3.0-4.7 mm OD, 100-171 mm TL), 0314H, PEM 15410 (RUSI 40614), 6656; ORI, Madagascar and Philippines; Id. MJS, PCH, TH.

**Otolith shape:** Oval-ovate. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Raised; **sculpture**, irregular. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Rounded and crenate or



irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, colliculi very indistinct. **Pseudocolliculum:** Absent. **Ostium:** Very reduced and narrow, lies along margin of rostrum. **Cauda:** Angled, deep becoming very deep, slightly sinuous, ending close to margin. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:1.7, 1:1.6, 1:1.6. **Collum:** Absent, step up to cauda. **Crista superior:** Broad ridge from ostium to flexion, well developed after flexion. **Crista inferior:** Well developed, may be a low ridge under cauda in large otoliths (c. 4.7 mm OD). **Dorsal depression:** Elongate and oval from antirostrum to flexion. **Ventral depression:** May have shallow depression under ventral crista and may have depression posterior to cauda (c. 4.7 mm OD). **Rostrum:** Large, broad and sharply rounded. **Antirostrum:** Small and blunt. **Excisura:** Moderately wide, notch very shallow, angle wide.

***Chaetodon xanthocephalus*, SSF No. 205.18  
PLATE 102**

**DISTRIBUTION:** Western Indian Ocean, south to Durban. Attains 20 cm.

**MATERIAL:** 1/1 (3.1 mm OD, 63.5 mm TL), PEM 0018; PEO; Id. GJBR.

**Otolith shape:** Oval-ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Raised; sculpture, irregular. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Rounded, notched and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Very reduced and narrow on rostrum, dorsal rostral margin irregular. **Cauda:** Angled, sinuous and flexed near tip. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:1.9. **Collum:** Absent. **Crista superior:** Ridge-like from ostium to flexion, poorly developed after flexion. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Elongate and oval. **Ventral depression:** Absent. **Rostrum:** Moderate, broad and sharply rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Moderately wide, notch shallow, angle wide.

***Forcipiger flavissimus*, SSF No. 205.20 PLATE 102**

**DISTRIBUTION:** From Durban to the Red Sea, across Indian and tropical Pacific Oceans to Easter Island and Baja California. Attains 16 cm.

**MATERIAL:** 3/11 (2.5-4.6 mm OD, 90-155 mm TL), PEM 8870 (RUSI 37448), 6001, 6707 (RUSI 28451), [6131 (RUSI 17190), 8659 (RUSI 37453)]; ORI, Durban; Id. MJS, PCH.

**Otolith shape:** Oval-ovate. **Thickness:** Moderate, but thickening (c. 4.6 mm OD). **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Raised; sculpture, slightly irregular. **Ventral margin:** Rounded and irregular. **Posterior margin:** Rounded and crenate or irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Short and shallow. **Cauda:** Angled ventrally, sinuous, gently flexed and deeper posteriorly. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:1.7, 1:1.5, 1:1.7. **Collum:** Absent. **Crista superior:** Ridge-like from ostium to flexion, broadening with growth, well developed after flexion. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Elongate and shallow. **Ventral depression:** Absent. **Rostrum:** Short, broad and sharply rounded. **Antirostrum:** Small and rounded. **Excisura:** Moderately wide, notch shallow, angle wide.

***Hemitaurichthys zoster*, SSF No. 205.21 PLATE 102**

**DISTRIBUTION:** Western Indian Ocean; south to Sodwana Bay. Attains 18 cm.

**MATERIAL:** 2/2 (4.7 mm OD, 3927 broken; 168, 178 mm TL), PEM 8644, 3927 (RUSI 12034); Ledsmann Shoal and Kosi Bay; Id. MJS, PCH.

**Otolith shape:** Oval to slightly ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Raised and emarginate anteriorly; sculpture, irregular. **Ventral margin:** Rounded and crenate or irregular. **Posterior margin:** Oblique, notched and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, extremely indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Flared, deeper anteriorly, ventral margin poorly defined. **Cauda:** Angled ventrally, very sinuous and flexed near tip. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:1.7. **Collum:** Absent. **Crista superior:** Ridge-like from ostium to flexion, poorly developed after flexion. **Crista inferior:** Very poorly developed under ostium, poorly developed under cauda. **Dorsal depression:** Very shallow and oval, dorsal groove on raised dorsal margin. **Ventral depression:** Absent. **Rostrum:** Very short, broad and rounded. **Antirostrum:** Small and blunt or sharply rounded. **Excisura:** Moderately wide, notch shallow, angle wide.

***Heniochus acuminatus*, SSF No. 205.22 PLATE 102**

**DISTRIBUTION:** Indo-West Pacific, south to Durban. Attains 25 cm.

**MATERIAL:** 3/10 (1.7-5.8 mm OD, 2752 = 201 mm TL, rest not measured), PEM 0373, 0008, 2752; Sodwana and Seaview; Id. GRA, GJBR, FCS.

**Otolith shape:** Oval-ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded or raised; sculpture, slightly irregular. **Ventral margin:** Rounded and crenate or irregular. **Posterior margin:** Rounded or sharply rounded, crenate or irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, very low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Small and slightly flared ventrally, deeper dorsally. **Cauda:** Approximately horizontal, sinuous and flexed near tip. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:1.8, 1:1.5, 1:1.3. **Collum:** Absent, step up to cauda. **Crista superior:** Ridge-like from ostium to flexion, well developed thereafter. **Crista inferior:** Poorly developed under ostium, well developed under cauda, may be a low ridge. **Dorsal depression:** Shallow and oval. **Ventral depression:** Narrow, below cauda. **Rostrum:** Short, broad and pointed. **Antirostrum:** Very small and sharply rounded. **Excisura:** Moderately wide, notch shallow, angle wide.

***Heniochus monoceros*, SSF No. 205.24 PLATE 102**

**DISTRIBUTION:** Indo-West Pacific, south to Cape Vidal. Attains 24 cm.

**MATERIAL:** 2/2 (2.0, 4.9 mm OD, 50, 160 mm TL), 0318H, PEM 15590; Philippines, Comoro Ids; Id. TH, PCH, lodged in JLBSP.

**Otolith shape:** Oval-ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral slightly concave. **Dorsal margin:** Rounded and peaked; sculpture, sinuate, develops spur. **Ventral margin:** Rounded and crenate or irregular. **Posterior margin:** Rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Relatively elongate, shallow and narrow. **Cauda:** Approximately horizontal, becoming sinuate, deepens and flexed near tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.4, 1:1.5. **Collum:** Absent. **Crista superior:** Ridge-like over anterior cauda, well developed at extremes. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Oval and shallow. **Ventral depression:** Absent. **Rostrum:** Broad and pointed. **Antirostrum:** Small and sharply rounded. **Excisura:** Moderately wide, notch shallow, angle varies.



## POMACANTHIDAE Nelson No. 339

**Family characteristics:** Otoliths oval-ovate up to c. 12 mm OD. Heterosulcoid with ostial opening, ostium elongate and approximately oval, cauda narrow and flexed near tip or angled ventrally and slightly flexed. Heteromorph, anterior colliculum usually oval and raised, almost filling ostium, posterior colliculum very indistinct and depressed, margins may be visible. Cristae well developed, usually not ridge-like except in some juveniles.

### Key

- 1a. Dorsal margin of otolith peaked; short ridge on lateral surface behind peak . . . . . 2
- 1b. Dorsal margin of otolith rounded, may be notched; no vertical ridge on lateral surface behind dorsal margin . . . . . 4
- 2a. Cauda angled; dorsal wall of ostium short . . . . .  
. . . . . *Apolemichthys trimaculatus* 204.2
- 2b. Cauda horizontal; dorsal wall of ostium horizontal and relatively long . . . . . 3
- 3a. Ostium short, broad and approximately rectangular; rostrum broad and sharply rounded . . . . .  
. . . . . *Genicanthus caudovittatus* 204.6
- 3b. Ostium elongate, moderately broad and approximately oblong; rostrum broad and rounded . . . . .  
. . . . . *Pygoplites diacanthus* 204.13
- 4a. Dorsal margin of otolith flat or slightly rounded and notched posteriorly, may be depressed; posterior margin not notched . . . . . 5
- 4b. Dorsal margin of otolith rounded and irregular; posterior margin may be notched . . . . . 7
- 5a. Otolith oblong or elongate; dorsal margin of otolith approximately flat; cauda approximately horizontal with slight flexion at tip. . . . . *Pomacanthus annularis* 204.7
- 5b. Otoliths oval-ovate; dorsal margin of otolith not flat; cauda with distinct flexion at tip or slightly flexed along its length . . . . . 6
- 6a. Ostium narrow; cauda elongate and gently flexed along its length . . . . . *Pomacanthus semicirculatus* 204.11
- 6b. Ostium narrow; cauda elongate, straight, flexed near tip; dorsal margin of otolith notched just anterior to caudal flexion . . . . . *Pomacanthus chrysurus* 204.8
- 6c. Ostium relatively broad; cauda not elongate, usually straight, flexed near tip . . . . . 8
- 7a. Ostium broad and relatively short; crista inferior right-angled at neck . . . . . *Pomacanthus imperator* 204.9
- 7b. Ostium relatively narrow and elongate; crista inferior not distinctly right-angled at neck . . . . .  
. . . . . *Pomacanthus rhomboides* 204.12
- 8a. Sulcus angled; rostrum elongate with dorsal opening of excisura on straight rostrum; crista superior over ostium short; posterior margin not notched . . . . .  
. . . . . *Centropyge acanthops* 204.3
- 8b. Sulcus horizontal or slightly angled; rostrum short and dorsal opening of excisura on short and irregular rostrum; posterior margin of otolith may be notched: *Centropyge bispinosus* 204.4 and *Centropyge multispinis* 204.5

### *Apolemichthys trimaculatus*, SSF No. 204.2 PLATE 103

**DISTRIBUTION:** Widely distributed in Indo-West Pacific; reaches Natal. Attains 25 cm.

**MATERIAL:** 2/2 (3.4, 4.65 mm OD, fish not measured), 1722H, PEM 0370; locality unknown; Id. FCS.

**Otolith shape:** Oval-ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral flat. **Lateral surface:** Short ridge

behind dorsal peak. **Dorsal margin:** Slightly rounded to peaked; sculpture, irregular. **Ventral margin:** Rounded and irregular. **Posterior margin:** Sharply rounded and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Oval, slightly flared dorsally. **Cauda:** Slightly angled, straight, flexed near tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.1, 1:1.3. **Collum:** Absent, slight step to cauda. **Crista superior:** Well developed over anterior ostium then low ridge-like along cauda, well developed at tip. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Shallow and oval. **Ventral depression:** Absent. **Rostrum:** Short, broad and sharply rounded. **Antirostrum:** Minute and sharply rounded. **Excisura:** Moderately wide, notch very shallow, angle wide.

### *Centropyge acanthops*, SSF No. 204.3 PLATE 103

**DISTRIBUTION:** Somalia to Algoa Bay. Attains 8 cm.

**MATERIAL:** 3/3 (3.6-3.85 mm OD, 69-75 mm TL), PEM 6481, 2862, 0441; ORI, Durban and Sodwana Bay; Id. MJS, PCH.

**Otolith shape:** Oblong-ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral convex or flat. **Lateral surface:** Short ridge behind posterior bulge. **Dorsal margin:** Rounded; sculpture, irregular. **Ventral margin:** Slightly rounded and irregular. **Posterior margin:** Sharply rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Oval, short dorsal wall. **Cauda:** Slightly angled ventrally and gently flexed. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.3, 1:1.1, 1:1.2. **Collum:** Absent. **Crista superior:** Low ridge over cauda, well developed at extremes. **Crista inferior:** Moderately well developed along sulcus. **Dorsal depression:** Shallow and indistinct. **Ventral depression:** Absent, shallow groove near margin. **Rostrum:** Moderate, broad and sharply rounded. **Antirostrum:** Minute and sharply rounded. **Excisura:** Moderately wide, very shallow, angle wide.

### *Centropyge bispinosus*, SSF No. 204.4 PLATE 103

**DISTRIBUTION:** Tropical Indo-West Pacific, south to Sodwana Bay. Attains 10 cm.

**MATERIAL:** 4/8 (3.0-6.18 mm OD, 53-88.8 mm TL), PEM 14258 (RUSI 30680), 2759, 15788, 0094; PEO, Sodwana and Comoro Ids; Id. GJBR, MJS, PCH.

**Otolith shape:** Oval-ovate or oblong-ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral flat. **Dorsal margin:** Rounded; sculpture, slightly irregular. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Slightly pointed, may be notched and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior colliculum low, posterior indistinct. **Pseudocolliculum:** Absent. **Ostium:** Oval, slightly deeper than cauda, widens ventrally with growth (c. 6 mm OD). **Cauda:** Slightly angled, slight flexion, deeper at tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.2, 1:1.2, 1:1.3, 1:1.2. **Collum:** Absent, step up to cauda. **Crista superior:** Well developed becoming ridge-like from ostium to flexion, well developed after flexion. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Shallow and elongate. **Ventral depression:** Absent, may be shallow, marginal groove. **Rostrum:** Moderately short, broad and sharply rounded. **Antirostrum:** Absent or minute and rounded. **Excisura:** Moderately wide, if present, notch very shallow, angle wide.

### *Centropyge multispinis*, SSF No. 204.5 PLATE 103

**DISTRIBUTION:** Indo-West Pacific, Seychelles south to Natal. Attains 14 cm.



**MATERIAL:** 4/8 (2.3-5.2 mm OD, 30-102 mm TL), PEM 8428 (RUSI 28501), 3912, 2794, 14794 (RUSI 31397), [6797 (RUSI 37445), 8666 (RUSI 37451), 8665 (RUSI 37452)]; off St Lucia to Kosi Bay; Id. GJBR, MJS, PCH.

**Otolith shape:** Oval-ovate. **Thickness:** Moderately thick. **Form:** - **Mesial** convex, - **Lateral** flat. **Dorsal margin:** Rounded; **sculpture**, irregular. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Sharply rounded and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Oval. **Cauda:** Slightly angled and slightly flexed, ends close to ventral margin. **Ostio-caudal differentiation:** Ventrally constricted, may be slight dorsal constriction. **Ostium/cauda:** 1:0.9, 1:1.2, 1:1.2, 1:1.2. **Collum:** Absent, slight step up to cauda. **Crista superior:** Ridge-like (< c. 4.5 mm OD), well developed in large otoliths but poorly developed at tip. **Crista inferior:** Poorly to moderately well developed along entire sulcus. **Dorsal depression:** Shallow in small (< c. 4.5 mm OD), absent in large. **Ventral depression:** Absent, may be shallow groove near margin in large otoliths (>5 mm OD). **Rostrum:** Short, broad and sharply rounded. **Antirostrum:** Absent or minute and rounded. **Excisura:** Moderately wide, notch, if present, very shallow, angle wide.

*Genicanthus caudovittatus*, SSF No. 204.6 PLATE 103

**DISTRIBUTION:** Mauritius, Red Sea and east African coast to Pinda, Mozambique. Attains 15 cm.

**MATERIAL:** 1/1 (c. 7.1 mm OD, 145 mm TL), PEM 15720 (RUSI 42663); Eilat, Red Sea; Id. PCH.

**Otolith shape:** Oval-ovate. **Thickness:** Moderate. **Form:** - **Mesial** convex, - **Lateral** Approximately flat with shallow postero-ventral groove and ventral lip. **Dorsal margin:** Peaked; **sculpture**, irregular. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Sharply rounded and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, raised anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Short, broad and approximately rectangular, dorsal wall approximately horizontal and moderately long. **Cauda:** Horizontal, slightly flexed at tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.3. **Collum:** Absent, slight step up to cauda. **Crista superior:** Well developed to low ridge above anterior ostium, ridge above cauda, well developed after flexion. **Crista inferior:** Well developed along sulcus. **Dorsal depression:** Large, oval and shallow, may be a shallow groove at margin. **Ventral depression:** Absent. **Rostrum:** Large, broad and sharply rounded. **Antirostrum:** Minute and sharply rounded. **Excisura:** Moderately wide, notch very shallow, angle wide.

*Pomacanthus annularis*, SSF No. 204.7 PLATE 103

**DISTRIBUTION:** Tropical Indo-West Pacific Ocean, south to Delagoa Bay. Attains c. 35 cm.

**MATERIAL:** 1/1 (8.28 mm OD, TL not recorded), PEM 0374; locality unknown; Id. FCS.

**Otolith shape:** Oblong. **Thickness:** Moderate. **Form:** - **Mesial** convex, - **Lateral** concave ventrally, only slightly concave dorsally, almost flat. **Dorsal margin:** Flat to slightly rounded; **sculpture**, irregular. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Flat and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Rectangular and elongate. **Cauda:** Approximately straight, slightly flexed and deeper posteriorly. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:0.9. **Collum:** Absent, slight step up to cauda. **Crista superior:** Well developed above anterior ostium, ridge above cauda, poor after

flexion. **Crista inferior:** Well developed along sulcus. **Dorsal depression:** Oval and shallow, posterior dorsal margin depressed. **Ventral depression:** Absent. **Rostrum:** Large, broad and rounded. **Antirostrum:** Very small and sharply rounded. **Excisura:** Moderately wide, notch shallow, angle varies.

*Pomacanthus chrysurus*, SSF No. 204.8 PLATE 103

**DISTRIBUTION:** Indo-West Pacific, Aden south to Aliwal Shoal (30°12'S). Attains c. 33 cm.

**MATERIAL:** 1/1 (7.92 mm OD, 228 mm TL), PEM 15388 (RUSI 40607); Madagascar; Id. PCH, MJS.

**Otolith shape:** Oblong. **Thickness:** Moderately thick. **Form:** - **Mesial** slightly convex, - **Lateral** slightly concave. **Lateral surface:** Dorsal margin thick and flattened at notch. **Dorsal margin:** Slightly rounded, notched; **sculpture**, slightly irregular. **Ventral margin:** Slightly rounded, crenate to irregular. **Posterior margin:** Sharply rounded and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, colliculi indistinct. **Pseudocolliculum:** Absent. **Ostium:** Elongate, oblong. **Cauda:** Straight, slightly flexed near tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1. **Collum:** Absent. **Crista superior:** Well developed along entire sulcus. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** At dorsal margin behind mid-point. **Ventral depression:** Absent, groove from flexion to mid-ostium near margin. **Rostrum:** Moderate, broad and sharply rounded. **Antirostrum:** Minute and sharply rounded. **Excisura:** Moderately wide, notch very shallow, angle acute.

*Pomacanthus imperator*, SSF No. 204.9 PLATE 103

**DISTRIBUTION:** Indo-West Pacific south to Natal, juvs to East London. Attains c. 40 cm.

**MATERIAL:** 5/12 (2.1-8.8 mm OD, 42-315 mm TL), 0755H, PEM 4369, 7708, 5907, 6673; ORI, Kosi Bay, Ledsmann Shoal and Sodwana; Id. MJS, MMS.

**Otolith shape:** Approximately circular (c. 2 mm OD), becoming oval-ovate. **Thickness:** Moderate. **Form:** - **Mesial** convex, - **Lateral** ventral section more concave than dorsal part. **Dorsal margin:** Slightly rounded; **sculpture**, serrate, irregular, may be notched. **Ventral margin:** Well rounded and crenate or slightly irregular. **Posterior margin:** Rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Oval, deepens, colliculum more raised with growth. **Cauda:** Sharply flexed (c. 2 mm OD), becoming more gently flexed and deeper. **Ostio-caudal differentiation:** Either ventrally or slightly dorso-ventrally constricted. **Ostium/cauda:** 1:1, 1:1.1, 1:1, 1:1, 1:0.9. **Collum:** Step up to cauda becomes low collum (c. 8 mm OD). **Crista superior:** Low ridge from ostium to flexion (c. 2 mm OD), well developed thereafter; larger otoliths have deep sulcus walls and well developed cristae along ostium and cauda. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Shallow, small otoliths (c. 4 mm OD) may have ridge in mid-area. **Ventral depression:** Absent. **Rostrum:** Small becoming moderately elongate with growth, and sharply rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Moderately wide, notch shallow, angle wide.

*Pomacanthus rhomboides*, SSF No. 204.12 PLATE 104

**DISTRIBUTION:** Southern Mozambique to Knysna. Attains c. 46 cm.

**MATERIAL:** 6/19 (2.15-12.0 mm OD, 25-340 mm TL), PEM 4884, 8636, 6780 (RUSI 28452), 4338, 14857, 8185; Sodwana, Natal, Kosi Bay and Algoa Bay; Id. MJS, PCH, MJS.

**Otolith shape:** Oval or oblong-ovate. **Thickness:** Moderate. **Form:** - **Mesial** convex, - **Lateral** concave, becoming more



concave with growth. **Dorsal margin:** Slightly rounded, may be notched; **sculpture**, slightly irregular. **Ventral margin:** Rounded and crenate or irregular. **Posterior margin:** Sharply rounded and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, distinct anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Oval, filled with colliculum. **Cauda:** Gently flexed and narrow. **Ostio-caudal differentiation:** Ventrally constricted or slight dorso-ventral constriction. **Ostium/cauda:** 1:1.1, 1:0.9, 1:1, 1:1.3, 1:0.8, 1:0.9. **Collum:** May be a low collum present. **Crista superior:** Ridge-like (c. 3 mm OD), well developed after flexion, well developed along entire sulcus in large otoliths. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Elongate in juveniles, absent in large otoliths (c. 12 mm OD), depression near notch on dorsal margin. **Ventral depression:** Absent. **Rostrum:** Large, broad and sharply rounded or rounded. **Antirostrum:** Small or minute, pointed or rounded. **Excisura:** Moderately wide, notch very shallow, angle wide.

***Pomacanthus semicirculatus*, SSF No. 204.11  
PLATE 104**

**DISTRIBUTION:** Indo-West Pacific, juvs reach Algoa Bay. Attains 40 cm.

**MATERIAL:** 3/8 (5.4-11.2 mm OD, 109-384 mm TL), PEM 6608 (RUSI 32186), 9595, 5906, [15393 (RUSI 40610)]; Kosi Bay and ORI; Id. MJS, PCH, MEA.

**Otolith shape:** Oblong-ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave ventrally, flat dorsally. **Dorsal margin:** Slightly rounded and raised and notched posteriorly; **sculpture**, slightly irregular. **Ventral margin:** Rounded and irregular. **Posterior margin:** Sharply rounded, crenate and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior colliculum slightly raised, posterior indistinct. **Pseudocolliculum:** Absent. **Ostium:** Oval and elongate. **Cauda:** Narrow and gently flexed. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.1, 1:0.9, 1:1.1. **Collum:** May be very low collum in neck. **Crista superior:** Well developed along entire sulcus. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Absent, margin depressed behind notch. **Ventral depression:** Absent. **Rostrum:** Large, broad and sharply rounded. **Antirostrum:** Minute and rounded. **Excisura:** Moderate, very shallow, angle wide.

***Pygoplites diacanthus*, SSF No. 204.13 PLATE 104**

**DISTRIBUTION:** Widespread in tropical Indo-West Pacific south to Sodwana Bay. Attains 25 cm.

**MATERIAL:** 1/1 (5.5 mm OD, 87 mm SL), 0975H; Eilat; Id. AB.

**Otolith shape:** Ovate. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral slightly concave. **Lateral surface:** Ridge behind raised dorsal margin. **Dorsal margin:** Rounded and raised; **sculpture**, slightly irregular. **Ventral margin:** Well rounded and approximately entire. **Posterior margin:** Broken. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior colliculum raised, posterior indistinct. **Pseudocolliculum:** Absent. **Ostium:** Oval, filled with colliculum, rostral tip may be raised. **Cauda:** Approximately horizontal, gently flexed. **Ostio-caudal differentiation:** Mainly ventrally constricted. **Ostium/cauda:** c. 1:1. **Collum:** Absent. **Crista superior:** Ridge-like from ostium to flexion, moderately well developed thereafter. **Crista inferior:** Moderately well developed along entire sulcus. **Dorsal depression:** Oval and shallow. **Ventral depression:** Absent, shallow marginal groove from ostium to beyond flexion. **Rostrum:** Broad, short and rounded. **Antirostrum:** Minute and rounded. **Excisura:** Moderately wide, notch very shallow and wide.

**PENTACEROTIDAE Nelson No. 341**

**Family characteristics:** Based on the single otolith available, shape is squarely ovate with ostial opening, measure at least 2.55 mm OD. Heterosulcoid, cauda distinctly closed and heteromorph with low colliculi.

***Histiopertus typus*, SSF No. 203.1 PLATE 104**

**DISTRIBUTION:** Cape Agulhas to Natal; also known from Red Sea, Oman, Japan, Philippines. Attains 35 cm.

**MATERIAL:** 1/1 (2.55 mm OD, 65 mm TL), PEM 0125; PEO; Id. GJBR.

**Otolith shape:** Squarely ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral flat. **Dorsal margin:** Flat, raised posteriorly; **sculpture**, crenate. **Ventral margin:** Rounded and crenate. **Posterior margin:** Slightly rounded to flattened and crenate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, colliculi low. **Pseudocolliculum:** Absent. **Ostium:** Narrow, lies mainly on rostrum, depressed in centre. **Cauda:** Approximately horizontal, tip slightly flexed, not clearly closed. **Ostio-caudal differentiation:** Slight dorso-ventral constrictions. **Ostium/cauda:** 1:1.3. **Collum:** Absent. **Crista superior:** Low ridge along anterior cauda, poorly developed elsewhere, absent at tip. **Crista inferior:** Very poorly developed along ostium, poorly developed under cauda. **Dorsal depression:** Shallow and oval. **Ventral depression:** Absent. **Rostrum:** Moderate, broad and rounded. **Antirostrum:** Short, broad and sharply rounded. **Excisura:** Moderately wide, notch shallow, angle acute.

**OPLEGNATHIDAE Nelson No. 343**

**Family characteristics:** Two species described. Otoliths oblong-ovate to fusiform, up to at least 10.8 mm OD. Heterosulcoid with ostial openings, ostium elongate, lying mainly along rostrum, especially in larger otoliths. Cauda straight, flexed at tip, may be deep. Heteromorph, colliculi low, may be indistinct. Crista superior ridge-like from ostium to flexion, crista inferior ridge-like under cauda, ventral depression distinct under flexion.

**Key**

- 1a. Otolith oblong-ovate becoming fusiform; rostrum becomes twisted and flexed along its length; cauda sharply flexed in large otolith; ostium very narrow, lies along rostrum . . . . . *Oplegnathus conwayi* 206.1
- 1b. Otolith oblong-ovate to rounded fusiform; rostrum not twisted and flexed; cauda gently flexed and slightly flared; ostium moderately broad, mainly on rostrum . . . . . *Oplegnathus robinsoni* 206.3

***Oplegnathus conwayi*, SSF No. 206.1 PLATE 104**

**DISTRIBUTION:** Common from False Bay to Natal. Attains 90 cm.

**MATERIAL:** 4/8 (3.4-10.75 mm OD, 110-628 mm TL), PEM 5485, 5568, 1081, 5567; Cape Recife, Durban and Algoa Bay; Id. MJS.

**Otolith shape:** Oblong-ovate to approximately fusiform. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Flattened; **sculpture**, slightly irregular. **Ventral margin:** Slightly rounded and flattened, notched, crenate or slightly irregular. **Posterior margin:** Rounded to sharply rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low anterior, narrow and small posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Lies mainly on rostrum, elongate becoming very narrow (c. 10 mm OD). **Cauda:** Straight, flexed and very deep at tip, undercutting ventral area in large otoliths (c. 10 mm OD). **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:0.8, 1:0.9, 1:0.9, 1:0.9. **Collum:** Absent. **Crista superior:** Ridge-like from ostium



to flexion, well developed thereafter. **Crista inferior:** Moderately well developed under ostium, well developed under cauda (c. 3 mm OD), becoming broad and ridge-like (10.8 mm OD). **Dorsal depression:** Shallow and oval. **Ventral depression:** From ventral margin, under cauda to neck, deepening with growth. **Rostrum:** Elongate, sharply rounded, twisted and flexed in large otoliths (c. 10 mm OD). **Antirostrum:** Small, moderately broad and either pointed or rounded. **Excisura:** Wide, notch shallow, angle varies.

***Oplegnathus robinsoni*, SSF No. 206.3 PLATE 104**

**DISTRIBUTION:** Only stray juveniles south of Natal; adults common from Delagoa Bay northwards. Attains 60 cm.

**MATERIAL:** 3/4 (5.42-9.4 mm OD, 180-380 mm TL), PEM 0721, 0297, 8248; Kosi Bay and PEO; Id. MJS, GJBR.

**Otolith shape:** Approximately oblong-ovate, becoming rounded fusiform (c. 9 mm OD). **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Approximately flat, slightly rounded or emarginate; **sculpture,** irregular. **Ventral margin:** Flat and notched, slightly irregular. **Posterior margin:** Rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, colliculi indistinct. **Pseudocolliculum:** Absent. **Ostium:** Elongate, relatively broad, lies mainly on rostrum, dorsal rostral edge raised. **Cauda:** Approximately straight, flexed, deepening and slightly flared posteriorly. **Ostio-caudal differentiation:** Dorso-ventral constrictions. **Ostium/cauda:** 1:0.8, 1:0.8, 1:0.9. **Collum:** Absent. **Crista superior:** Well developed above ostium, ridge-like above anterior cauda, well developed at tip. **Crista inferior:** Poorly developed under ostium, broad ridge under cauda. **Dorsal depression:** Very shallow and oval. **Ventral depression:** From ventral margin, under cauda to neck. **Rostrum:** Long, moderately broad and sharply rounded. **Antirostrum:** Large or small and sharply rounded. **Excisura:** Wide, notch shallow or deep, angle varies.

**CICHLIDAE Nelson No. 344**

**Family characteristics:** One species described. Otolith shape and highly irregular margins are characteristic; up to at least 7.3 mm OD. Heterosulcoid with ostial opening. Ostium oval, flares dorsally; cauda with flexion near tip. Heteromorph with low but distinct colliculi.

***Oreochromis mossambicus*, SSF No. 218.1 PLATE 105**

**DISTRIBUTION:** Bushmans River (eastern Cape) northwards, in fresh or salt water, rare in the open sea. Attains c. 40 cm.

**MATERIAL:** 5/15 (2.4-7.32 mm OD, 56-233 mm TL), PEM 1676, 1677, 1669, 1670, 3385; North End Lake, Port Elizabeth; Id. MJS.

**Otolith shape:** Oval-ovate. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral slightly concave or flat. **Dorsal margin:** Rounded; **sculpture,** serrate to very irregular. **Ventral margin:** Rounded, lobed and very irregular. **Posterior margin:** Rounded, lobed and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Moderately deep and oval, flares dorsally. **Cauda:** Slightly flexed, deepening and flaring slightly posteriorly. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:0.9, 1:1, 1:0.9, 1:0.8, 1:1. **Collum:** Absent. **Crista superior:** Ridge-like from ostium to flexion, well developed thereafter. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Oval, shallow, deepening with growth. **Ventral depression:** Absent, very shallow groove in mid-area. **Rostrum:** Large, broad and rounded. **Antirostrum:** Very small and sharply rounded. **Excisura:** Moderately wide, notch shallow, angle acute.

**POMACENTRIDAE Nelson No. 346**

**Family characteristics:** Otolith shape oval-ovate or oblong, up to c. 5.6 mm OD. Heterosulcoid, ostium usually wider than cauda but may be approximately same width, with either ostial or ostio-caudal openings. Ventral wall of ostium often strongly angled ventrally. Cauda usually flexed except in those species with ostio-caudal openings. Heteromorph with low or indistinct colliculi. Crista superior usually ridge-like over anterior cauda.

**Key**

- 1a. Otolith oblong; sulcus opening ostio-caudal . . . . . 2
- 1b. Otolith oval-ovate; sulcus opening ostial . . . . . 3
- 2a. Dorsal margin of otolith flat, slightly raised posteriorly; dorsal and ventral areas very reduced; ventral margin entire and slightly rounded . . . *Chromis dasygerys* 219.13
- 2b. Dorsal margin of otolith raised and notched; dorsal area oval and raised above antirostrum and posterior part of dorsal area; ventral margin crenate and slightly rounded . . . . . *Neopomacentrus cyanomos* 219.29
- 3a. Cauda extremely wide, angled towards postero-ventral corner . . . . . *Lepidozygus tapeinosoma* 219.28
- 3b. Cauda not extremely wide, flexed or sinuous . . . . . 4
- 4a. Dorsal margin domed or slightly domed . . . . . 5
- 4b. Dorsal margin slightly rounded, may be peaked or with dorsal point . . . . . 6
- 5a. Dorsal margin raised and domed; dorsal area with horizontal depression across dome; cauda approximately horizontal, tip with slight, short flexion . . . . . *Amphiprion akallopisos* 219.8
- 5b. Dorsal margin rounded or raised to slightly domed; dorsal area without horizontal depression, dorsal depression oval over anterior cauda; cauda moderately wide, strongly flexed . . . . . *Chromis viridis* 219.12
- 6a. Ostium widely flared dorsally and ventrally . . . . . 7
- 6b. Ostium not widely flared dorsally and ventrally . . . . . 9
- 7a. Rostrum large, broad and rounded; otolith oblong-ovate . . . . . *Plectroglyphidodon lacrymatus* 219.36
- 7b. Rostrum short, broad and blunt or rounded; otolith oval-ovate . . . . . 8
- 8a. Crista superior forms a strong, broad ridge over anterior cauda; caudal tip ends relatively far from ventral margin . . . . . *Plectroglyphidodon dickii* 219.33
- 8b. Crista superior forms narrow ridge over anterior cauda; caudal tip ends very close to ventral margin . . . . . *Plectroglyphidodon leucozonus* 219.37
- 9a. Cauda straight, flexed tip not closed . . . . . *Dascyllus carneus* 219.26
- 9b. Cauda sinuous or strongly flexed, if almost straight, tip of cauda narrows, usually closed . . . . . 10
- 10a. Sulcus approximately horizontal but tip of cauda flexed . . . . . 11
- 10b. Sulcus angled ventrally, tip of cauda usually flexed . . . . . 13
- 11a. Ventral margin of ostium ventrally flexed; dorsal margin of otolith raised but slightly emarginate anteriorly; caudal tip not closed, may be groove to margin . . . . . *Abudefduf sexfasciatus* 219.4
- 11b. Ventral margin of ostium approximately horizontal; dorsal margin of otolith raised but not emarginate anteriorly; tip of cauda closed . . . . . 12
- 12a. Dorsal margin of otolith raised and emarginate or slightly emarginate posteriorly; ostium wide and relatively widely flared dorsally; crista superior over cauda forms a broad ridge to flexion; posterior margin narrow and sharply rounded . . . *Amphiprion allardi* 219.9



- 12b. Dorsal margin of otolith raised and rounded or slightly peaked; ostium not widely flared dorsally; crista superior forms a narrower ridge to slightly beyond flexion; posterior margin of otolith relatively broad and rounded . . . . . *Pomacentrus trilineatus* 219.42
- 13a. Rostrum large and rounded; antero-ventral margin of ostium strongly curved ventrally. . . . . *Abudefduf sordidus* 219.5
- 13b. Rostrum shorter, may be rounded or sharply rounded; antero-ventral margin of ostium either horizontal or slightly ventrally curved . . . . . 14
- 14a. Cauda strongly sinuous and elongate; ventral margin of ostium distinctly sinuous and curved ventrally; posterior margin of otolith depressed . . . . . *Dascyllus trimaculatus* 219.27
- 14b. Cauda slightly sinuous, curved or approximately straight; ventral margin of ostium slightly curved ventrally, may be slightly sinuous; posterior margin of otolith not depressed . . . . . 15
- 15a. Ventral margin of otolith well rounded, may appear bulbous; rostrum small, broad and sharply rounded . . . . . *Chromis dimidiata* 219.14
- 15b. Ventral margin of otolith slightly rounded, does not appear bulbous; rostrum narrower or short, broad and rounded . . . . . 16
- 16a. Ventral margin of ostium barely constricted at neck . . . . . 17
- 16b. Ventral margin of ostium distinctly constricted at neck . . . . . 18
- 17a. Cauda more elongate and strongly flexed at tip . . . . . *Chrysiptera leucopoma* 219.23
- 17b. Cauda shorter, slightly flexed with deep groove on floor at tip . . . . . *Pomacentrus trichourus* 219.41
- 18a. Cauda distinctly wide . . . *Abudefduf vaigiensis* 219.7
- 18b. Cauda narrow or not distinctly wide . . . . . 19
- 19a. Cauda angled ventrally and slightly curved along its length; dorsal margin of otolith flat and oblique anteriorly . . . . . *Chromis nigrura* 219.16
- 19b. Cauda slightly curved or sinuous, tip distinctly flexed; antero-dorsal margin not flat and oblique . . . 20
- 20a. Ventral margin of ostium slightly sinuous and angled ventrally; cauda relatively short but strongly flexed . . . . . *Chromis weberi* 219.19
- 20b. Ventral margin of ostium approximately horizontal to slightly sinuous, not strongly angled ventrally; cauda relatively more elongate and flexed . . . . . 21
- 21a. Ostium relatively short and broad; cauda extends closer to posterior margin; rostrum short, broad and rounded; dorsal margin of otolith rounded . . . . . *Abudefduf sparoides* 219.6
- 21b. Ostium relatively elongate and narrow; cauda not as close to posterior margin; rostrum larger, broad and rounded or sharply rounded; dorsal margin of otolith slightly rounded, may become peaked . . . . . *Chromis opercularis* 219.17

#### *Abudefduf sexfasciatus*, SSF No. 219.4 PLATE 105

**DISTRIBUTION:** Indo-West Pacific and Red Sea, south to Pinda, Mozambique. Attains 17 cm.

**MATERIAL:** 2/3 (4.0, 5.0 mm OD, 120, c. 145 mm TL), PEM 0364, 5917; Durban, Natal; Id. GJBR, MJS.

**Otolith shape:** Oblong. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Lateral surface:** Ridge under dorsal peak in large (>4.5 mm OD) otoliths. **Dorsal margin:** Slightly

rounded and peaked; **sculpture**, slightly irregular. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Rounded and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, colliculi very indistinct. **Pseudocolliculum:** Absent. **Ostium:** Oval and deep, ventral wall curved ventrally at anterior. **Cauda:** Straight and strongly flexed, tip not closed, may be groove to margin at tip. **Ostio-caudal differentiation:** Ventrally constricted, curved dorsally. **Ostium/cauda:** 1:1.6, 1:1.4. **Collum:** Absent, slight step up to cauda. **Crista superior:** Ridge-like along anterior cauda, well developed elsewhere. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Elongate and shallow. **Ventral depression:** Absent, may be groove from margin to caudal tip. **Rostrum:** Moderate, broad and sharply rounded. **Antirostrum:** Minute and sharply rounded. **Excisura:** Moderate, notch very shallow, angle wide.

#### *Abudefduf sordidus*, SSF No. 219.5 PLATE 105

**DISTRIBUTION:** Indo-Pacific to Hawaiian Ids; south to Port Alfred. Attains 23 cm.

**MATERIAL:** 2/6 (3.0, 3.7 mm OD, 100, 155 mm TL), PEM 0445, 6594; ORI; Id. GJBR, MJS.

**Otolith shape:** Oval-ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Rounded and raised; **sculpture**, irregular. **Ventral margin:** Slightly rounded to flat and slightly irregular. **Posterior margin:** Rounded, notched and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, colliculi indistinct. **Pseudocolliculum:** Absent. **Ostium:** Reduced and narrow, lies along rostrum with ventral margin curved ventrally. **Cauda:** Angled ventrally, gently flexed. **Ostio-caudal differentiation:** Slight ventral constriction, dorsally curved. **Ostium/cauda:** 1:1.7, 1:1.7. **Collum:** Absent, slight step up to cauda. **Crista superior:** Ridge-like along entire sulcus. **Crista inferior:** Poorly developed under ostium, well developed along cauda. **Dorsal depression:** Oval and elongate. **Ventral depression:** Absent. **Rostrum:** Moderate to large and rounded, flexed ventrally and laterally. **Antirostrum:** Small and pointed. **Excisura:** Wide, notch shallow, angle varies.

#### *Abudefduf sparoides*, SSF No. 219.6 PLATE 105

**DISTRIBUTION:** From Kenya to Transkei coast, also at Reunion, Mauritius and probably Madagascar. Attains 16 cm.

**MATERIAL:** 2/2 (2.4, 3.05 mm OD, 58, 85 mm TL), PEM 2841, 2840; Kosi Bay; Id. GRA.

**Otolith shape:** Oval-ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Rounded; **sculpture**, irregular. **Ventral margin:** Slightly rounded, crenate or irregular. **Posterior margin:** Sharply rounded and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, colliculi very indistinct. **Pseudocolliculum:** Absent. **Ostium:** Moderately deep, with ventral margin almost horizontal, slightly curved ventrally. **Cauda:** Anterior approximately horizontal, moderately strongly flexed. **Ostio-caudal differentiation:** Ventrally constricted, dorsal gently curved. **Ostium/cauda:** 1:1, 1:1.1. **Collum:** Absent, slight step up to cauda. **Crista superior:** Well developed over anterior ostium, ridge-like along cauda, well developed after flexion. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Oval, dorsal area slopes to margin. **Ventral depression:** Shallow and oval below caudal tip. **Rostrum:** Short, broad and sharply rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Moderately wide, notch shallow, angle wide.

#### *Abudefduf vaigiensis*, SSF No. 219.7 PLATE 105

**DISTRIBUTION:** Tropical Indo-West Pacific, south to Port Alfred. Attains 20 cm.



**MATERIAL:** 4/13 (2.3-5.0 mm OD, 72-c. 170 mm TL), PEM 2839, 4353, 8790 (RUSI 37516), 5914, [8789 (RUSI 37516), 6647 (RUSI 28455), 15437 (RUSI 40585)]; Limestone, ORI and Kosi Bay; Id. MJS, GA, PCH.

**Otolith shape:** Oblong-ovate. **Thickness:** Moderate. **Form:** - **Mesial** convex, - **Lateral** concave. **Dorsal surface:** Dorsal ridge with pit on dorsal edge. **Dorsal margin:** Slightly rounded and raised or peaked; **sculpture**, slightly irregular. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Sharply rounded and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, very low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Oval and deep. **Cauda:** Wide, angled ventrally, slightly flexed and deepening at tip. **Ostio-caudal differentiation:** Ventrally constricted with slight dorsal curve. **Ostium/cauda:** 1:1.1, 1:1.4, 1:1.4, 1:1.5. **Collum:** Absent. **Crista superior:** Well developed at anterior, ridge-like along cauda, poor at tip. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Above crista, may extend to margin. **Ventral depression:** Absent, may be shallow groove near margin from caudal tip. **Rostrum:** Short, broad and rounded. **Antirostrum:** Small to moderate, rounded becoming pointed. **Excisura:** Moderately wide, notch shallow or moderate, angle varies.

#### *Amphiprion akallopisos*, SSF No. 219.8 PLATE 105

**DISTRIBUTION:** Reefs of tropical Indian Ocean (except Maldives and Sri Lanka) and the Seribu Ids (Java Sea); south to Aliwal Shoal (near Durban). Attains 9 cm.

**MATERIAL:** 2/2 (2.6, 3.0 mm OD, 60, 72 mm TL), PEM 11312, 8873; ORI; Id. MJS.

**Otolith shape:** Oval-ovate. **Thickness:** Moderately thick. **Form:** - **Mesial** convex, - **Lateral** slightly concave. **Dorsal margin:** Raised and domed; **sculpture**, slightly irregular. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Sharply rounded and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Moderately deep, colliculum protrudes through excisura. **Cauda:** Approximately horizontal, tip with slight, short flexion, walls steep. **Ostio-caudal differentiation:** Dorsally constricted, slight curve ventrally. **Ostium/cauda:** 1:1.2, 1:1.1. **Collum:** Absent, slight step up to cauda. **Crista superior:** Well developed along entire sulcus. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Dorsal area with horizontal depression across dome. **Ventral depression:** Absent. **Rostrum:** Short, broad and pointed. **Antirostrum:** Small and rounded. **Excisura:** Moderately wide, notch shallow, angle wide.

#### *Amphiprion allardi*, SSF No. 219.9 Plate 106

**DISTRIBUTION:** Known only from east Africa as far south as Durban. Attains 14 cm.

**MATERIAL:** 4/14 (2.3-4.3 mm OD, 63-128 mm TL), PEM 4388, 6758 (RUSI 28453), 6130 (RUSI 17187), 8633, [8430 (RUSI 34127), 8786-8788, 8631 & 8632 (all RUSI 37518)]; Kosi Bay, ORI and Ledsman Shoal; Id. MJS, PCH.

**Otolith shape:** Oval to approximately oblong, to rounded-ovate. **Thickness:** Moderate. **Form:** - **Mesial** convex, - **Lateral** concave. **Lateral surface:** May be ridge under ostium. **Dorsal margin:** Raised and rounded, becoming emarginate posteriorly (c. 3 mm OD); **sculpture**, crenate or irregular. **Ventral margin:** Slightly rounded, slightly crenate or irregular. **Posterior margin:** Sharply rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Flared dorsally, deep, colliculum protrudes through excisura. **Cauda:** Approximately horizontal, short flex at tip. **Ostio-caudal differentiation:** Either dorsally or dorso-ventrally constricted. **Ostium/cauda:**

1:0.9, 1:1.2, 1:1.1, 1:1.6. **Collum:** Absent, step up to cauda. **Crista superior:** Well developed over anterior ostium, broad ridge along cauda to flexion, well developed after flexion. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Elongate over crista, dorsal margin depressed. **Ventral depression:** Absent. **Rostrum:** Broad and rounded to pointed. **Antirostrum:** Absent or small and rounded. **Excisura:** Moderately wide, notch, if present very shallow, angle wide.

#### *Chromis dasygenys*, SSF No. 219.13 PLATE 106

**DISTRIBUTION:** Known only from Delagoa Bay to Durban but probably extends further south. Attains 12 cm.

**MATERIAL:** 2/2 (4.1, 4.85 mm OD, 102, 122 mm TL), PEM 3902, 4339; Brighton Beach and Durban; Id. PCH.

**Otolith shape:** Oblong. **Thickness:** Moderately thick. **Form:** - **Mesial** convex, - **Lateral** concave. **Dorsal margin:** Flat and slightly emarginate; **sculpture**, slightly irregular. **Ventral margin:** Slightly rounded and entire. **Posterior margin:** Sharply rounded and slightly irregular. **Sulcus acusticus:** Ostio-caudal, heterosulcoid. **Colliculum:** Heteromorph, distinct anterior, low posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Almost filled with oval colliculum, protrudes through dorsal margin, ventral margin poorly defined. **Cauda:** Wide, contains narrow colliculum, posterior poorly defined. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:1.4, 1:1.6. **Collum:** Absent. **Crista superior:** High ridge to mid-cauda, absent over posterior. **Crista inferior:** Poorly developed along entire sulcus. **Dorsal depression:** Groove in centre of ridge, dorsal area very reduced, postero-dorsal margin depressed. **Ventral depression:** Absent. **Rostrum:** Large, broad and sharply rounded. **Antirostrum:** Small or very small and pointed. **Excisura:** Moderately wide, notch very shallow, angle acute.

#### *Chromis dimidiata*, SSF No. 219.14 PLATE 106

**DISTRIBUTION:** Tropical Indian Ocean; Red Sea to Durban. Attains 7 cm.

**MATERIAL:** 5/24 (1.6-3.6 mm OD, 30-70 mm TL), PEM 8446, 8424, 2659, 8423 (RUSI 28499), 8871, [8426 (RUSI 34105)]; ORI, Kosi Bay and Sodwana Bay; Id. MJS, PCH.

**Otolith shape:** Oval-ovate. **Thickness:** Moderate. **Form:** - **Mesial** convex, - **Lateral** flat. **Dorsal margin:** Rounded; **sculpture**, crenate or lobed. **Ventral margin:** Well rounded, may appear bulbous, crenate or irregular. **Posterior margin:** Rounded and lobed. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, with very low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Approximately oval, flares dorsally. **Cauda:** Sinuous, narrow, angled and flexed with poorly defined tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.3, 1:1.3, 1:1.3, 1:1.3, 1:1. **Collum:** Absent, step up to cauda. **Crista superior:** Well developed over ostium, ridge-like over anterior cauda, very poorly developed at tip. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Oval and shallow. **Ventral depression:** Absent. **Rostrum:** Small, broad and rounded becoming sharply rounded. **Antirostrum:** Minute or small, sharply rounded or rounded. **Excisura:** Moderately wide, notch very shallow, angle wide.

#### *Chromis nigrura*, SSF No. 219.16 PLATE 106

**DISTRIBUTION:** Tropical western Indian Ocean to Sri Lanka and the Maldives; south to Transkei coast. Attains 6 cm.

**MATERIAL:** 3/3 (1.5-2.1 mm OD, 39-51 mm TL), PEM 2772, 2771, 2856; Sodwana Bay; Id. GJBR.

**Otolith shape:** Oval-ovate. **Thickness:** Moderate. **Form:** - **Mesial** convex, - **Lateral** slightly concave. **Dorsal margin:** Rounded with flat, oblique anterior margin; **sculpture**, slightly



irregular or crenate. **Ventral margin:** Rounded, crenate or irregular. **Posterior margin:** Sharply rounded, crenate or slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, with very low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Oval and moderately deep. **Cauda:** Angled ventrally, slightly curved along its length. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:1.3, 1:1.3, 1:1.1. **Collum:** Absent, step up to cauda. **Crista superior:** Well developed over ostium, ridge-like over anterior cauda, well developed after flexion. **Crista inferior:** Poor under ostium, well developed under cauda. **Dorsal depression:** Oval and shallow. **Ventral depression:** Absent. **Rostrum:** Moderate, broad and sharply rounded. **Antirostrum:** Very small and sharply rounded. **Excisura:** Moderately wide, notch shallow, angle wide.

***Chromis opercularis*, SSF No. 219.17 PLATE 106**

**DISTRIBUTION:** Tropical Indian Ocean, south to Sodwana Bay. Attains 16 cm.

**MATERIAL:** 5/5 (4.7-5.6 mm OD, 126-156 mm TL), PEM 8246 (RUSI 28514), 14793 (RUSI 31385), 15785, 6647 (RUSI 28455), 14792 (RUSI 31416); St Lucia, ORI, Comoro Ids, Kosi Bay; Id. MJS, PCH.

**Otolith shape:** Oblong-ovate. **Thickness:** Moderate to moderately thick in large otoliths. **Form:** - Mesial convex, - Lateral slightly concave. **Dorsal margin:** Slightly rounded or peaked; **sculpture**, serrate or irregular. **Ventral margin:** Rounded, serrate or irregular. **Posterior margin:** Sharply rounded and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Oval, flares dorsally, low colliculum protrudes through excisura, depression near neck. **Cauda:** Straight, flexed and deepening posteriorly, tip poorly defined. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1, 1:1.2, 1:1.5, 1:1, 1:1.3. **Collum:** Absent, step up to cauda. **Crista superior:** Well developed over ostium, ridge-like over anterior cauda, well developed after flexion, poor at tip. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Oval and elongate. **Ventral depression:** Absent, shallow groove close to margin from cauda to under ostium. **Rostrum:** Large, broad and rounded or sharply rounded. **Antirostrum:** Very small and sharply rounded. **Excisura:** Moderately wide, notch shallow, angle wide.

***Chromis viridis*, SSF No. 219.12 PLATE 106**

**DISTRIBUTION:** Tropical Indo-West Pacific, south to Inhaca. Attains 8 cm.

**MATERIAL:** 2/2 (1.45, c. 1.5 mm OD, 44, 46 mm TL), 1038H, 1037H; Eilat; Id. TH.

**Otolith shape:** Oval-ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral slightly concave or flat. **Dorsal margin:** Rounded, raised to slightly domed; **sculpture**, entire. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Sharply rounded and entire. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, very low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Dorsal wall flared dorsally, reduced and narrow, lying mainly along rostrum. **Cauda:** Moderately wide, strongly flexed. **Ostio-caudal differentiation:** Dorsally constricted. **Ostium/cauda:** 1:1.3, 1:1.7. **Collum:** Absent, step up to cauda. **Crista superior:** Ridge-like to flexion, well developed to tip. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Oval, postero-dorsal margin depressed. **Ventral depression:** Absent. **Rostrum:** Elongate and sharply rounded. **Antirostrum:** Short, broad and rounded. **Excisura:** Moderately wide, notch shallow, angle wide.

***Chromis weberi*, SSF No. 219.19 PLATE 107**

**DISTRIBUTION:** Tropical Indo-West Pacific; abundant at Sodwana Bay and Aliwal Shoal (near Durban). Attains 12 cm.

**MATERIAL:** 3/6 (3.3-4.15 mm OD, 93-113 mm TL), PEM 2901, 2801, 2769; Sodwana; Id. GRA.

**Otolith shape:** Oblong-ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral slightly concave. **Dorsal margin:** Slightly rounded or raised; **sculpture**, irregular. **Ventral margin:** Rounded and crenate or irregular. **Posterior margin:** Sharply rounded and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, very low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Approximately oval, ventral wall angled slightly ventrally. **Cauda:** Straight, flexed and deepening at flexion with poorly defined tip. **Ostio-caudal differentiation:** Mainly ventrally constricted. **Ostium/cauda:** 1:1.1, 1:1.3, 1:1.1. **Collum:** Absent, step up to cauda. **Crista superior:** Well developed over ostium and after flexion, ridge-like over cauda, absent at tip. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Oval and elongate. **Ventral depression:** Absent. **Rostrum:** Moderate, broad and sharply rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Moderately wide, notch shallow, angle wide.

***Chrysiptera leucopoma*, SSF No. 219.23 PLATE 107**

**DISTRIBUTION:** Tropical Indo-West Pacific. Attains 7 cm.

**MATERIAL:** 2/2 (2.3, 2.3 mm OD, 58, 61 mm TL), PEM 2847, 2716; Sodwana and Kosi Bays; Id. GRA.

**Otolith shape:** Oval-ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral slightly concave. **Dorsal margin:** Rounded, slightly raised; **sculpture**, irregular. **Ventral margin:** Rounded and crenate or irregular. **Posterior margin:** Blunt, may be notched and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Flares dorsally and ventrally, deeper at neck. **Cauda:** Slightly sinuous, flexed near tip. **Ostio-caudal differentiation:** Dorsally constricted, ventrally barely constricted. **Ostium/cauda:** 1:1.1, 1:1.2. **Collum:** Absent, step up to cauda. **Crista superior:** Well developed over anterior ostium, ridge-like to flexion, well developed after flexion. **Crista inferior:** Poorly developed under anterior ostium, well developed elsewhere. **Dorsal depression:** Oval. **Ventral depression:** Absent, may be shallow groove near margin. **Rostrum:** Short, broad and sharply rounded or blunt. **Antirostrum:** Absent or minute and sharply rounded. **Excisura:** Moderately wide, notch very shallow if present, angle wide.

***Dascyllus carneus*, SSF No. 219.26 PLATE 107**

**DISTRIBUTION:** Tropical Indian Ocean and Java Sea south to Durban. Attains 7 cm.

**MATERIAL:** 3/7 (1.7-2.85 mm OD, 44-84 mm TL), 0996H, PEM 14242 (RUSI 30632), 15789; Comoro Ids and Eilat; Id. PCH, AD.

**Otolith shape:** Oval-ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral slightly concave. **Dorsal margin:** Well rounded, becoming slightly rounded, may have rounded notch and a point; **sculpture**, slightly irregular. **Ventral margin:** Rounded, flattened posteriorly, may be notched and slightly irregular. **Posterior margin:** Rounded, narrowing and slightly irregular. **Sulcus acusticus:** Ostio-caudal, heterosulcoid. **Colliculum:** Heteromorph, very indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Short, flared and moderately deep. **Cauda:** Fairly broad, angled ventrally, flexed near tip and open. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.6, 1:2.4, 1:2.1. **Collum:** Absent, step up to cauda. **Crista superior:** Ridge-like to flexion, well developed after flexion, absent at tip. **Crista inferior:** Poorly developed under ostium, well developed



under anterior cauda, broad ridge under posterior cauda. **Dorsal depression:** Oval and deep. **Ventral depression:** Absent, groove close to margin. **Rostrum:** Short, broad and pointed or rounded. **Antirostrum:** Small and rounded or sharply rounded. **Excisura:** Moderately wide, notch shallow, angle wide.

***Dascyllus trimaculatus*, SSF No. 219.27 PLATE 107**

**DISTRIBUTION:** Tropical Indo-West Pacific, south to Great Fish Point. Attains 14 cm.

**MATERIAL:** 3/9 (3.8-4.5 mm OD, 100-141 mm TL), PEM 8791 (RUSI 37435), 2812, 2811; Sodwana Bay; Id. GJBR, PCH.

**Otolith shape:** Oblong-ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Rounded or raised to a peak; **sculpture,** irregular. **Ventral margin:** Slightly rounded or notched, crenate or irregular. **Posterior margin:** Sharply rounded and irregular. **Sulcus acusticus:** Ostial, may appear ostio-caudal as caudal tip indistinct, heterosulcoid. **Colliculum:** Heteromorph, indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Deep, ventral margin sinuous and flexed ventrally. **Cauda:** Sinuous, moderately deep, flexed, tip closed but poorly defined. **Ostio-caudal differentiation:** Mainly ventrally constricted, dorsal margin curved. **Ostium/cauda:** 1:1.4, 1:1.7, 1:1.5. **Collum:** Absent. **Crista superior:** Well developed over anterior ostium becoming ridge-like to flexion then well developed, but tip very poorly developed. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Oval and deep, dorsal margin uneven and depressed. **Ventral depression:** Absent, posterior margin depressed. **Rostrum:** Short, broad and sharply rounded. **Antirostrum:** Very small or small and pointed. **Excisura:** Moderately wide, notch very shallow, angle varies.

***Lepidozygus tapeinosoma*, SSF No. 219.28 PLATE 107**

**DISTRIBUTION:** Tropical Indo-West Pacific, south to Durban. Attains 10 cm.

**MATERIAL:** 2/6 (2.3, 2.5 mm OD, 73, 79 mm TL), PEM 14234 & 14236 (both RUSI 30635); Comoro Ids; Id. PCH.

**Otolith shape:** Oval-ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Emarginate anteriorly, raised and rounded posteriorly; **sculpture,** approximately entire. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Oblique and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, extremely low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Short, flared dorsally and moderately deep, colliculum penetrates excisura. **Cauda:** Very wide, flared dorsally, horizontal then angled ventrally to point. **Ostio-caudal differentiation:** Dorsally constricted, slight ventral narrowing. **Ostium/cauda:** 1:2.4, 1:2.2. **Collum:** Absent, slight step to cauda. **Crista superior:** High ridge to mid-cauda then well developed. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Groove along ridge, area sharply angled to margin. **Ventral depression:** Absent, margin below caudal tip depressed. **Rostrum:** Short, broad and pointed. **Antirostrum:** Short and rounded. **Excisura:** Moderately wide, notch shallow, angle wide.

***Neopomacentrus cyanomos*, SSF No. 219.29  
PLATE 107**

**DISTRIBUTION:** Tropical Indian Ocean and Indo-Australian Archipelago; south to Kosi Bay. Attains 9 cm.

**MATERIAL:** 2/4, same No. (2.5, 2.55 mm OD, TL not recorded), 1746H; locality unknown; Id. FCS.

**Otolith shape:** Oblong-ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded and notched; **sculpture,** slightly irregular. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Sharply rounded and slightly irregular. **Sulcus acusticus:** Ostio-

caudal, heterosulcoid. **Colliculum:** Heteromorph, slightly raised colliculi. **Pseudocolliculum:** Absent. **Ostium:** Approximately oval, flares dorsally, with distinct colliculum, dorsal margin poorly defined. **Cauda:** Ventral margin horizontal, postero-dorsal margin very poorly defined, colliculum long and straight. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:1.3, 1:1.5. **Collum:** Absent. **Crista superior:** Absent over ostium, high ridge over cauda, absent at posterior. **Crista inferior:** Very poorly developed along entire sulcus. **Dorsal depression:** Elongate groove in ridge, dorsal area very reduced, sharply angled to margin. **Ventral depression:** Absent, shallow, narrow groove at ventral margin. **Rostrum:** Large, broad and sharply rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Moderately wide, notch shallow, angle wide.

***Plectroglyphidodon dickii*, SSF No. 219.33 PLATE 107**

**DISTRIBUTION:** Tropical Indo-West Pacific, south to Sodwana Bay. Attains 11 cm.

**MATERIAL:** 1/2 (2.5mm OD, 60mm TL), PEM 14245; Comoro Ids; Id. PCH.

**Otolith shape:** Oval-ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Raised; **sculpture,** slightly irregular. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Rounded and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Flares, ventral margin sinuous and ventrally angled. **Cauda:** Sinuous and flexed. **Ostio-caudal differentiation:** Very slight dorso-ventral constrictions. **Ostium/cauda:** 1:1.8. **Collum:** Absent. **Crista superior:** Well developed above ostium and after flexion, narrow and ridge-like above anterior cauda, poorly developed at tip. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Oval and elongate. **Ventral depression:** Absent. **Rostrum:** Short, broad and rounded. **Antirostrum:** Minute and rounded. **Excisura:** Moderately wide, notch extremely shallow and angle wide.

***Plectroglyphidodon lacrymatus*, SSF No. 219.36  
PLATE 107**

**DISTRIBUTION:** Tropical Indo-West Pacific south to Sodwana Bay. Attains 10 cm.

**MATERIAL:** 3/3 (3.35-4.3 mm OD, 74-87 mm TL), PEM 15657, 1014H, PEM 14266 (RUSI 31144); Eilat and Comoro Ids; Id. PCH, TH.

**Otolith shape:** Oblong-ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave or flat. **Dorsal margin:** Raised to a peak; **sculpture,** slightly irregular. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Rounded and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Oval, elongate, ventral margin angled ventrally. **Cauda:** Sinuous and flexed posteriorly, tip indistinct. **Ostio-caudal differentiation:** Slight ventral constriction, dorsal curved. **Ostium/cauda:** 1:1.5, 1:1.2, 1:1.2. **Collum:** Absent. **Crista superior:** Well developed over anterior ostium and after flexion, ridge-like above cauda, very poor at tip. **Crista inferior:** Moderately well developed along entire sulcus. **Dorsal depression:** Oval. **Ventral depression:** Absent, narrow groove near margin. **Rostrum:** Large, relatively elongate, broad and rounded. **Antirostrum:** Minute or very small and pointed. **Excisura:** Moderately wide, notch shallow, angle wide.

***Plectroglyphidodon leucozonus*, SSF No. 219.37  
PLATE 108**

**DISTRIBUTION:** Tropical Indo-West Pacific south to the Transkei. Attains 12 cm.



**MATERIAL:** 3/4 (2.55-3.5 mm OD, 93-c. 120 mm TL), PEM 2679, 6766 (RUSI 28454), 0878; Sodwana, Durban and Botla Point; Id. JER, GRA, PCH.

**Otolith shape:** Oval-ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded or raised; **sculpture,** slightly irregular. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Rounded and slightly irregular. **Sulcus acusticus:** Ostial, may appear ostio-caudal as caudal tip close to margin, heterosulcoid. **Colliculum:** Heteromorph, indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Flared, steep-walled, ventral margin sinuous and angled ventrally. **Cauda:** Sinuous and flexed, tip poorly defined. **Ostio-caudal differentiation:** Ventrally constricted, dorsally curved. **Ostium/cauda:** 1:1.6, 1:1.5, 1:1.7. **Collum:** Absent. **Crista superior:** Well developed over anterior ostium, forms broad, strong ridge over anterior cauda, well developed after flexion, absent at tip. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Oval. **Ventral depression:** Absent, may be a groove near ventral margin. **Rostrum:** Short, broad, blunt and angular. **Antirostrum:** Very small and pointed. **Excisura:** Moderately wide, notch very shallow, angle wide.

#### *Pomacentrus trichourus*, SSF No. 219.41 PLATE 108

**DISTRIBUTION:** Red Sea; south to Sodwana Bay. Attains 10 cm.

**MATERIAL:** 2/2 (2.6, 4.05 mm OD, 47, 82 mm TL), PEM 8422 (RUSI 28500), 15783; Kosi Bay, Comoro Ids; Id. PCH.

**Otolith shape:** Oval-ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral flat. **Dorsal margin:** Slightly rounded, becomes slightly raised or peaked; **sculpture,** crenate or irregular. **Ventral margin:** Rounded and crenate or slightly irregular. **Posterior margin:** Sharply rounded and crenate, becoming blunt and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Flared dorsally, approximately triangular. **Cauda:** Slightly sinuous, flexed and groove on floor at flexion. **Ostio-caudal differentiation:** Slightly dorsally, barely ventrally constricted. **Ostium/cauda:** 1:1.3, 1:1.3. **Collum:** Absent, step up to cauda. **Crista superior:** Well developed over ostium, ridge-like along cauda, may be absent at tip. **Crista inferior:** Moderately well developed along entire sulcus. **Dorsal depression:** Oval. **Ventral depression:** Absent, margin groove develops (c. 4 mm OD). **Rostrum:** Short, broad and sharply rounded. **Antirostrum:** Small and rounded. **Excisura:** Moderate, notch shallow, angle wide.

#### *Pomacentrus trilineatus*, SSF No. 219.42 PLATE 108

**DISTRIBUTION:** Found along the east African coast north of Inhaca, at Madagascar and the Red Sea. Attains 10 cm.

**MATERIAL:** 2/2 (3.45, 3.9 mm OD, 78, 101 mm TL), 1205H, 1204H; Red Sea; Id. TH.

**Otolith shape:** Oval-ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral flat. **Dorsal margin:** Raised, rounded; **sculpture,** slightly irregular. **Ventral margin:** Slightly rounded and irregular. **Posterior margin:** Rounded and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, extremely indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Deep, oval and ventral wall approximately horizontal, flares dorsally. **Cauda:** Deep, horizontal anterior, flexed and expanded and indistinct at tip. **Ostio-caudal differentiation:** Slight dorso-ventral constrictions. **Ostium/cauda:** 1:1.3, 1:1.8. **Collum:** Absent, step up to cauda. **Crista superior:** Well developed over anterior ostium and after flexion, ridge-like along anterior cauda, very poorly developed at tip. **Crista inferior:** Well developed along sulcus. **Dorsal depression:** Oval. **Ventral depression:** Absent, groove close to margin. **Rostrum:** Large, broad and sharply rounded. **Antirostrum:** Very small or small, and

sharply rounded. **Excisura:** Moderately wide, notch very shallow, angle wide.

### CIRRHITIDAE Nelson No. 348

**Family characteristics:** Otoliths oblong to oblong-ovate, up to c. 6.1 mm OD. Heterosulcoid with ostial opening. Cauda straight and flexed or slightly flexed at tip. Heteromorph with very low or indistinct colliculi.

#### Key

- 1a. Otolith oblong . . . . . 2
- 1b. Otolith oblong-ovate . . . . . 4
- 2a. Ostium short and broad; antero-dorsal wall poorly developed, may appear absent . . . . . *Amblycirrhitus bimacula* 214.1
- 2b. Ostium elongate; dorsal wall of ostium moderately well developed or ridge-like . . . . . 3
- 3a. Dorsal wall of ostium elongate and slightly curved ventrally; dorsal area narrow . . . . . *Paracirrhitus forsteri* 214.7
- 3b. Dorsal wall of ostium slightly flared and relatively shorter; dorsal area wider . . . . . *Paracirrhitus arcatus* 214.6
- 4a. Cauda gently flexed; ventral margin of otolith only slightly depressed . . . . . 5
- 4b. Cauda straight and sharply flexed near tip; ventral margin of otolith distinctly depressed . . . . . 6
- 5a. Otolith narrow and elongate; crista inferior distinctly constricted at neck; walls of ostium parallel; cauda elongate; dorsal and ventral areas of otolith narrow; ridge on lateral surface from postero-ventral corner to nucleus . . . . . *Cirrhitus pinnulatus* 214.3
- 5b. Otolith broader; crista inferior only slightly constricted at neck; walls of ostium slightly flared dorsally; dorsal and ventral area relatively broad; lateral surface with no distinct features . . . . . *Paracirrhitus arcatus* 214.6
- 6a. Crista superior a broad, rounded ridge; excisural notch shallow; postero-ventral corner of otolith produced or pointed . . . . . *Cirrhitichthys oxycephalus* 214.2
- 6b. Crista superior a narrow ridge; excisural notch relatively deep; posterior margin of otolith sharply rounded . . . . . *Cyprinocirrhitus polyactis* 214.5

#### *Amblycirrhitus bimacula*, SSF No. 214.1 PLATE 108

**DISTRIBUTION:** Indo-Pacific; extends south to Durban. Attains 8 cm.

**MATERIAL:** 1/1 (2.3 mm OD, 63 mm TL), PEM 2855; Sodwana Bay; Id. GJBR.

**Otolith shape:** Oblong. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral slightly convex. **Dorsal margin:** Slightly raised; **sculpture,** approximately entire. **Ventral margin:** Slightly rounded, crenate and irregular. **Posterior margin:** Sharply rounded and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior slightly raised, posterior colliculum extremely indistinct. **Pseudocolliculum:** Absent. **Ostium:** Flared, depressed in anterior and centre, dorsal margin poorly developed, ventral wall approximately horizontal. **Cauda:** Moderately deep, straight, flexed near tip which is not distinctly closed. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.5. **Collum:** Absent. **Crista superior:** Ridge-like from mid-ostium to cauda, absent over anterior ostium and caudal tip. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Oval and elongate. **Ventral depression:** Margin depressed under caudal tip, shallow groove in mid-ventral area. **Rostrum:** Very short, broad and pointed. **Antirostrum:** Absent. **Excisura:** Moderately wide, notch absent.



***Cirrhichthys oxycephalus*, SSF No. 214.2 PLATE 108**

**DISTRIBUTION:** Indo-Pacific and tropical eastern Pacific. Extends south to East London. Attains 9.5 cm

**MATERIAL:** 3/11 (2.3-2.85 mm OD, 58-78mm TL), PEM 14244 (RUSI 30610), 2766, 2912; Sodwana Bay and Comoro Ids; Id. GRA, MJS, PCH.

**Otolith shape:** Oblong-ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral slightly concave. **Dorsal margin:** Slightly rounded; **sculpture**, irregular. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Sharply rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Flares dorsally, ventral margin approximately horizontal, depressed in central and anterior ostium. **Cauda:** Straight, flexed near tip, deep, posterior wall of tip poorly defined. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.2, 1:1.0, 1:1.1. **Collum:** Absent. **Crista superior:** Broad, rounded ridge from ostium to flexion, poorly developed after flexion. **Crista inferior:** Moderately well developed with low ridge under flexion. **Dorsal depression:** Oval and elongate. **Ventral depression:** Margin depressed under caudal tip, and distinct groove near margin from ostium to caudal tip. **Rostrum:** Large, broad and sharply rounded. **Antirostrum:** Absent or small and rounded. **Excisura:** Moderately wide, notch very shallow if present, angle wide.

***Cirrhitis pinnulatus*, SSF No. 214.3 PLATE 108**

**DISTRIBUTION:** Indo-Pacific; in this area south to Port Alfred. Attains at least 28 cm.

**MATERIAL:** 2/2 (5.15, 6.08 mm OD, 207, 223 mm TL), 0635H, PEM 2732; Sodwana and Durban; Id. MMS, GJBR, TH.

**Otolith shape:** Oblong. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Lateral surface:** Ridge from postero-ventral corner to nucleus. **Dorsal margin:** Slightly rounded; **sculpture**, slightly irregular. **Ventral margin:** Slightly rounded and crenate and irregular. **Posterior margin:** Sharply rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Elongate, deep, approximately parallel dorsal and ventral margins and very deep. **Cauda:** Straight, deep, flexed near tip and moderately deep. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.2, 1:1.3. **Collum:** Absent, step up to cauda. **Crista superior:** Well developed along sulcus length, poor at tip. **Crista inferior:** Well developed along sulcus length. **Dorsal depression:** Absent or shallow. **Ventral depression:** Absent or very shallow. **Rostrum:** Short, broad and sharply rounded. **Antirostrum:** Small and pointed. **Excisura:** Moderately wide, notch shallow, angle acute.

***Cypinocirrhites polyactis*, SSF No. 214.5 PLATE 108**

**DISTRIBUTION:** East Africa to western Pacific; south to Algoa Bay. Attains c. 14 cm.

**MATERIAL:** 1/1 (4.4 mm OD, 174 mm TL), PEM 7720 (RUSI 20111); ORI; Id. PCH.

**Otolith shape:** Oblong-ovate. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Approximately flat; **sculpture**, lobed. **Ventral margin:** Slightly rounded and crenate to irregular. **Posterior margin:** Sharply rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, colliculi indented and not distinct. **Pseudocolliculum:** Absent. **Ostium:** Slightly flared and deep. **Cauda:** Straight, sharply flexed, deep. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.3. **Collum:** Absent, step up to cauda. **Crista superior:** Ridge-like from ostium to flexion, well developed after flexion and at tip.

**Crista inferior:** Well developed under ostium and anterior cauda, ridge-like under flexion. **Dorsal depression:** Oval and moderately deep, margin depressed. **Ventral depression:** Depressed under flexion, ventral groove from ostium to caudal tip. **Rostrum:** Elongate, large and sharply rounded. **Antirostrum:** Short, broad and blunt. **Excisura:** Moderately wide, notch shallow, angle acute.

***Paracirrhites arcatus*, SSF No. 214.6 PLATE 109**

**DISTRIBUTION:** Indo-Pacific south to the Transkei. Attains 14 cm.

**MATERIAL:** 3/3 (2.35-3.44 mm OD, 58-93 mm TL), PEM 2911, 14243, 2908; Sodwana Bay and Comoro Ids; Id. GRA, PCH.

**Otolith shape:** Oblong to oblong-ovate. **Thickness:** Moderate to moderately thick. **Form:** - Mesial convex, - Lateral slightly concave. **Dorsal margin:** Slightly raised; **sculpture**, entire or slightly irregular. **Ventral margin:** Slightly rounded or crenate and irregular. **Posterior margin:** Sharply rounded or pointed and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, colliculi indistinct. **Pseudocolliculum:** Absent. **Ostium:** Slightly flared, deepens anteriorly with steep walls. **Cauda:** Slightly sinuate, flexed at tip, posterior wall of tip poorly defined. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.3, 1:1.5, 1:1.6. **Collum:** Absent, may be slight step to cauda. **Crista superior:** Moderately well developed at anterior ostium, well developed or low ridge from mid-ostium to flexion, after flexion poorly developed. **Crista inferior:** Moderately developed along entire sulcus. **Dorsal depression:** Shallow (<2.5mm OD), absent in larger otoliths. **Ventral depression:** Absent, shallow ventral groove in small otoliths (<3.5 mm OD). **Rostrum:** Short, broad and pointed. **Antirostrum:** Absent or small and pointed. **Excisura:** Moderately wide, notch absent or shallow, angle wide.

***Paracirrhites forsteri*, SSF No. 214.7 PLATE 109**

**DISTRIBUTION:** Indo-Pacific, south to Inhaca, Mozambique. Attains c. 22 cm.

**MATERIAL:** 1/1 (2.4 mm OD, 65 mm TL), 0801H; Sodwana; Id. PCH.

**Otolith shape:** Oblong. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral slightly concave. **Dorsal margin:** Slightly rounded; **sculpture**, slightly irregular. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Pointed, slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Oval, elongate, moderately shallow. **Cauda:** Approximately straight with short flexion near tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.1. **Collum:** Absent, slight step to cauda. **Crista superior:** Low ridge from ostium to flexion, moderately well developed thereafter. **Crista inferior:** Poorly developed under ostium, well developed under cauda, short ridge after flexion. **Dorsal depression:** Elongate and shallow. **Ventral depression:** Under caudal tip, very shallow ventral groove close to margin. **Rostrum:** Short, broad and sharply rounded. **Antirostrum:** Absent. **Excisura:** Moderate, notch absent.

**CHEILODACTYLIDAE Nelson No 351**

**Family characteristics:** Otoliths oval or oblong-ovate to fusiform, up to at least 9.5 mm OD. Heterosulcoid with ostial opening but may become ostio-caudal with growth and erosion of posterior margin. Ostium initially small and approximately triangular and flared, becoming reduced, narrow and lies mainly along rostrum. Cauda straight, flexed, flared and deep at tip. Heteromorph, anterior colliculum may be nodular, posterior usually indistinct. Crista superior ridge-like to mid-cauda, ventral area has deep groove in larger specimens.



## KEY

- 1a. Otolith fusiform; rostrum elongate and narrow; ventral margin of otolith approximately flat . . . . . *Cheilodactylus fasciatus* 215.1
- 1b. Otolith may be fusiform; rostrum shorter or raised dorsally if elongate; ventral margin of otolith slightly rounded or sinuate . . . . . 2
- 2a. Dorsal margin of otolith emarginate . . . . . 3
- 2b. Dorsal margin of otolith rounded . . . . . 4
- 3a. Crista superior a short ridge; posterior margin of otolith erodes and sulcus opening becomes ostio-caudal; rostrum tapering and pointed; ventral groove short, extends just beyond neck; antirostrum short . . . . . *Chirodactylus brachydactylus* 215.3
- 3b. Crista superior ridge extends to flexion; posterior margin of otolith entire; sulcus opening ostial; rostrum short, tapering; ventral groove extends to caudal tip; antirostrum elongate . . . . *Chirodactylus grandis* 215.4
- 4a. Crista superior a short ridge; ostium moderately broad, lies along rostrum; anterior colliculum nodular; cauda sharply flexed and deep, undercuts ventral area; rostrum elongate; ventral area may be grooved and irregular . . . . . *Chirodactylus jessicalenorum* 215.5
- 4b. Crista superior ridge-like to flexion; ostium very narrow; anterior colliculum indistinct; cauda less deep, does not undercut ventral area; rostrum short and tapered; ventral area not markedly grooved . . . *Cheilodactylus pixi* 215.2

### *Cheilodactylus fasciatus*, SSF No. 215.1 PLATE 109

**DISTRIBUTION:** Subtidally to 25 m, from Kunene River, Namibia to Natal. Attains 30 cm.

**MATERIAL:** 5/50 (1.79-6.5 mm OD, 74-275 mm TL), PEM 2306, 10380, 12603, 1138 (RUSI 8563), 11343; Algoa Bay and vicinity; Id. MJS, PCH.

**Otolith shape:** Oval (<2mm OD) becoming fusiform (c. 6 mm OD). **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Rounded; sculpture, lobed or irregular. **Ventral margin:** Slightly rounded becoming flat, crenate and irregular. **Posterior margin:** Rounded to sharply rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior indistinct, posterior colliculum has slightly raised margin. **Pseudocolliculum:** Absent. **Ostium:** Narrow and deep, mainly on rostrum. **Cauda:** Approximately straight, flexed at tip and deep. **Ostio-caudal differentiation:** Slight dorsal constriction. **Ostium/cauda:** 1:1.3, 1:0.9, 1:0.8, 1:0.9, 1:0.9. **Collum:** Absent, step up to cauda. **Crista superior:** Ridge-like from ostium to flexion, well developed after flexion. **Crista inferior:** Well developed with short ridge under flexion. **Dorsal depression:** Shallow and covers most of dorsal area. **Ventral depression:** Margin depressed under caudal tip, joining ventral margin groove which extends as far as ostium in large otoliths (>5 mm OD). **Rostrum:** Short and broad (<2 mm OD) becoming elongate and pointed (>2.8 mm OD). **Antirostrum:** Minute becoming large and sharply rounded (>5 mm OD). **Excisura:** Moderate becoming wide, notch shallow, deepening with growth, angle wide becoming acute.

### *Cheilodactylus pixi*, SSF No. 215.2 PLATE 109

**DISTRIBUTION:** From Knysna to Coffee Bay, Transkei. Attains 18 cm.

**MATERIAL:** 4/65 (2.0-4.75 mm OD, 82-186 mm TL), PEM 5587, 3193 (RUSI 11622), 5340 (RUSI 13870), 4526; Cape south coast; Id. MJS, PCH.

**Otolith shape:** Oval-ovate (c. 2 mm OD) becoming approximately oblong-ovate (>3.5 mm OD). **Thickness:** Moderate. **Form:** -

Mesial flat, - Lateral slightly convex. **Dorsal margin:** Slightly rounded; sculpture, irregular. **Ventral margin:** Slightly rounded or flat, crenate or irregular. **Posterior margin:** Sharply rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior indistinct, posterior colliculum ventral margin raised. **Pseudocolliculum:** Absent. **Ostium:** Narrow and deep, lies mainly along rostrum in large otoliths (c. 4 mm OD). **Cauda:** Straight with flexion at wide, deep tip. **Ostio-caudal differentiation:** Slight dorso-ventral constrictions. **Ostium/cauda:** 1:1.4, 1:0.9, 1:1, 1:0.9. **Collum:** Absent, slight step up to cauda. **Crista superior:** Broken ridge from ostium to flexion, moderately poorly developed thereafter. **Crista inferior:** Well developed along sulcus, absent at tip. **Dorsal depression:** Oval. **Ventral depression:** Absent, may be a nodular groove near margin. **Rostrum:** Short and broad becoming moderate, broad and pointed. **Antirostrum:** Moderate, broad and pointed. **Excisura:** Moderate, becoming wide, notch moderate becoming deep, angle wide.

### *Chirodactylus brachydactylus*, SSF No. 215.3 PLATE 109

**DISTRIBUTION:** Walvis Bay to Delagoa Bay. Attains 40 cm.

**MATERIAL:** 4/60 (2.05-6.55 mm OD, 87-381 mm TL), PEM 2613 (RUSI 11442), 14398, 2941, 0052; Cape south coast; Id. GJBR, MJS, PCH.

**Otolith shape:** Oval-ovate (c. 2 mm OD) becoming oblong-ovate (c. 4 mm OD). **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Slightly rounded to raised posteriorly; sculpture, slightly irregular. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Sharply rounded or rounded and notched, lobed or irregular. **Sulcus acusticus:** Ostial becoming ostio-caudal with erosion of posterior wall (c. 6.5 mm OD), heterosulcoid. **Colliculum:** Heteromorph, colliculi slightly raised. **Pseudocolliculum:** Absent. **Ostium:** Elongate, may have irregular granulations on colliculum. **Cauda:** Approximately straight, deepens and expands at flexed tip. **Ostio-caudal differentiation:** Slight dorso-ventral constrictions. **Ostium/cauda:** 1:1.2, 1:0.9, 1:1, 1:1.2. **Collum:** Absent, may be step up to cauda in large otoliths. **Crista superior:** Ridge-like from ostium to mid-cauda, moderately well developed to tip. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Elongate, dorsal margin erodes to join it in large otoliths (c. 6.6 mm OD). **Ventral depression:** Absent, ventral groove becomes deep in large otoliths (c. 5.4 mm OD). **Rostrum:** Short and broad becoming elongate and pointed, curves laterally. **Antirostrum:** Small and sharply rounded. **Excisura:** Moderate, becoming wide, notch shallow becoming moderate, angle varies.

### *Chirodactylus grandis*, SSF No. 215.4 PLATE 110

**DISTRIBUTION:** From Walvis Bay along Cape south coast, possibly to Natal. Attains at least 1 m.

**MATERIAL:** 5/33 (1.5-9.1 mm OD, 60-870 mm TL), PEM 7193, 11632, 12204, 0311, 10264; Cape south coast; Id. MJS, TH.

**Otolith shape:** Oval-ovate to oblong-ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded to emarginate anteriorly; sculpture, slightly irregular or irregular. **Ventral margin:** Slightly rounded and irregular. **Posterior margin:** Rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Flared, lies mainly along rostrum, colliculum nodular. **Cauda:** Slightly sinuous, deepens and widens at slightly flexed tip, sulcus becomes deeper with growth. **Ostio-caudal differentiation:** Slight dorso-ventral constrictions. **Ostium/cauda:** 1:1.3, 1:1, 1:1.2, 1:1.1, 1:1.3. **Collum:** Absent, may be step up to cauda. **Crista superior:** Uneven ridge from ostium to mid-cauda, well



developed to tip. **Crista inferior:** Well developed along entire sulcus (c. 1.5 mm OD) becoming an uneven, broad ridge. **Dorsal depression:** Elongate, may join the dorsal margin with erosion in large specimens (c. 9 mm OD). **Ventral depression:** Absent, deep groove in mid-area in large otoliths (>5 mm OD). **Rostrum:** Short and broad becoming elongate and pointed, curves laterally with growth. **Antirostrum:** Small becoming large and pointed (c. 5 mm OD). **Excisura:** Moderate, becoming wide, notch shallow, becoming deep, angle wide becoming acute.

***Chirodactylus jessicalenorum*, SSF No. 215.5  
PLATE 110**

**DISTRIBUTION:** Coffee Bay (Transkei) to Sodwana Bay. Attains 50 cm.

**MATERIAL:** 2/3 (6.8, 9.4 mm OD, 440, 795 mm TL), PEM 9632, 12460; Algoa Bay and ORI; Id. MJS.

**Otolith shape:** Oblong-ovate or fusiform. **Thickness:** Moderate. **Form:** - **Mesial** convex, - **Lateral** concave. **Dorsal margin:** Slightly raised or flat; **sculpture**, irregular. **Ventral margin:** Slightly rounded or flat, crenate and irregular. **Posterior margin:** Rounded or sharply rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, nodular anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Flared, lies mainly on rostrum with nodular colliculum. **Cauda:** Straight, flexed near tip, deep, undercutting ventral area. **Ostio-caudal differentiation:** Slight dorso-ventral constrictions. **Ostium/cauda:** 1:1.3, 1:1. **Collum:** Absent. **Crista superior:** Uneven ridge from ostium to mid-cauda, well developed to tip. **Crista inferior:** Well developed under ostium and after flexion, may be ridge under anterior cauda. **Dorsal depression:** Short, deep depression above crista. **Ventral depression:** Absent, deep grooves usually present. **Rostrum:** Large, elongate, raised dorsally and pointed. **Antirostrum:** Large and pointed. **Excisura:** Wide, notch moderate to deep, angle acute.

**CEPOLIDAE Nelson No. 354**

**Family characteristics:** One species described. Otoliths rhomboidal or rounded rectangular up to c. 10 mm OD. Heterosulcoid with ostial or para-ostial openings, heteromorph. Ostium elongate, angled dorsally with low, oval colliculum. Cauda short and round with low round colliculum. Cristae poorly developed except for crista superior with low ridge from mid-ostium to mid cauda.

***Owstonia cf. weberi?*, SSF No. 226.- PLATE 110**

**DISTRIBUTION:** Trawled in 190-350m, from Natal to Kenya. Attains 52 cm.

**MATERIAL:** 5/5 (5.48-9.9 mm OD, 90-260 mm SL), PEM 5090 & 5089 (both RUSI 14018), 1578H, 1585H, 5091 (RUSI 14018); Kenya; Id. PCH.

**Otolith shape:** Rhomboidal or rounded rectangular. **Thickness:** Moderate. **Form:** - **Mesial** slightly convex or flat, - **Lateral** flat. **Dorsal margin:** Flat or slightly rounded; **sculpture**, crenate or slightly irregular. **Ventral margin:** Rounded or flat, crenate or slightly irregular. **Posterior margin:** Sharply rounded or flat, approximately entire. **Sulcus acusticus:** Para-ostial or ostial (uncoated may appear mesial), heterosulcoid. **Colliculum:** Heteromorph with distinct and slightly raised colliculi. **Pseudocolliculum:** Absent. **Ostium:** Angled dorsally, elongate with large, oval colliculum, poorly defined ventral wall. **Cauda:** Approximately circular and small with round colliculum and poorly defined posterior wall. **Ostio-caudal differentiation:** Slight dorso-ventral constrictions. **Ostium/cauda:** 1:0.4, 1:0.4, 1:0.4, 1:0.5, 1:0.4. **Collum:** Low, joining cristae. **Crista superior:** Poorly developed along anterior ostium and caudal tip, low curved ridge from mid-ostium to mid-cauda. **Crista inferior:** Very poorly developed along entire sulcus. **Dorsal depression:**

Oval and shallow, covers most of dorsal area. **Ventral depression:** Shallow crescentic depression in mid-area. **Rostrum:** Short, broad and rounded or sharply rounded. **Antirostrum:** Minute and sharply rounded. **Excisura:** Minute or moderate, notch very shallow, angle acute.

**MUGILIDAE Nelson No. 355**

**Family characteristics:** Otoliths oval becoming oblong with growth, up to at least 13 mm OD. Heterosulcoid with ostial opening. Ostium usually oval or rounded, cauda characteristically elongate, narrow and usually sinuous, may have recurved tip. Heteromorph, anterior colliculum low, posterior usually indistinct but crystalline. Dorsal area often reduced with sulcus close to margin, ventral margin angled and depressed or depressed as a step. Lateral surface has a strong ridge behind sulcus making the otoliths moderately thick.

**Key**

- 1a. Dorsal margin of otolith with distinct broad emargination, raised anteriorly and posteriorly . . . . . 2
- 1b. Dorsal margin of otolith slightly rounded or flattened . . . . . 5
- 2a. Sulcus approximately straight, cauda flexed at tip; otolith narrows posteriorly. . . . . *Valamugil robustus* 222.14
- 2b. Sulcus sinuous with caudal tip flexed or slightly flexed . . . . . 3
- 3a. Cauda strongly sinuous; dorsal margin in the emarginate area is curved, following shape of cauda; anterior raised area of dorsal margin lobe-like over neck; ventral area stepped down, approximately 2/3rds of ventral area is distinctly depressed . . . . . *Valamugil buechanani* 222.12
- 3b. Cauda less sinuous; dorsal margin edge either flattened and angled or horizontal; anterior raised area of dorsal margin raised and curved or angled but not lobe-like; ventral area depressed as angle or slight step, but depressed area smaller . . . . . 4
- 4a. Emarginate area of dorsal margin flattened and angled; antero-dorsal corner of otolith sharply angled; otolith moderately broad; cauda distinctly sinuous; ventral area slopes to margin angularly. . . . . *Crenimugil crenilabis* 222.1
- 4b. Emargination of dorsal margin less marked; antero-dorsal corner of otolith more rounded; cauda slightly sinuous; ventral area sharply depressed with step . . . . . *Valamugil seheli* 222.15
- 5a. Cauda almost straight, not sinuous, slightly curved along its length . . . . . *Mugil cephalus* 222.10
- 5b. Cauda sinuous or slightly sinuous, tip curved or recurved . . . . . 6
- 6a. Ostium short, deep and rounded dorsally and ventrally (cup-like); cauda strongly sinuous; postero-ventral margin of otolith slightly produced; caudal tip usually recurved . . . . . *Myxus capensis* 222.11
- 6b. Ostium moderately elongate, not distinctly rounded and cup-like; cauda slightly sinuous or almost straight, flexed near tip, may be recurved . . . . . 7
- 7a. Ostium only slightly wider than cauda, not flared widely dorsally . . . . . 8
- 7b. Ostium slightly bulbous ventrally, flares slightly or flares widely dorsally . . . . . 9
- 8a. Ostium short; cauda sinuous; cauda flexes towards dorsal margin, tip sharply curved or recurved; ventral margin of otolith depressed . . . . . *Liza richardsonii* 222.7
- 8b. Ostium elongate and narrow; cauda slightly flexed, almost straight, tip curved; postero-ventral corner of otolith depressed . . . . . *Liza tricuspidens* 222.8



- 9a. Ostium short, flared dorsally, slightly bulbous ventrally; cauda slightly sinuous to almost straight, tip flexed or recurved . . . . . *Liza dumerilii* 222.3
- 9b. Ostium moderately long; cauda slightly sinuous, tip strongly curved to recurved . . . . . 10
- 10a. Ostium strongly bulbous ventrally; postero-ventral corner bulbous and depressed with diagonal groove at its base . . . . . *Liza alata* 222.2
- 10b. Ostium oval and elongate; cauda sinuous to approximately straight; ventral margin of otolith slightly rounded, not bulbous, may have hole in ventral area with groove to caudal tip . . . *Liza macrolepis* 222.5

***Crenimugil crenilabis*, SSF No. 222.1 PLATE 110**

**DISTRIBUTION:** Indo-West Pacific from Marshall and Tuamoto Ids, Japan, Red Sea and south to Transkei. Attains 40 cm.

**MATERIAL:** 1/1 (6.5 mm OD, 242 mm TL), 1179H; Red Sea; Id. IP.

**Otolith shape:** Oblong. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral slightly concave. **Dorsal margin:** Emarginate and flat, raised anterior and posterior corners; **sculpture**, slightly irregular. **Ventral margin:** Slightly rounded and irregular. **Posterior margin:** Rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Short, deep and flared widely. **Cauda:** Sinuate, narrow and walls steep, flexed at tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:2.1. **Collum:** Absent, step up to cauda. **Crista superior:** Very poorly developed over ostium, ridge-like from neck to flexion, well developed after flexion. **Crista inferior:** Poorly developed under anterior ostium, well developed elsewhere. **Dorsal depression:** Elongate, dorsal area reduced. **Ventral depression:** Absent, margin with angled depression. **Rostrum:** Short, broad and blunt. **Antirostrum:** Minute and pointed. **Excisura:** Moderately wide, notch very shallow, angle wide.

***Liza alata*, SSF No. 222.2 PLATE 110**

**DISTRIBUTION:** Indo-West Pacific, reaches Algoa Bay. Attains 75 cm.

**MATERIAL:** 1/1 (7.9 mm OD, 270 mm TL), 0468H; Transkei; Id. TH.

**Otolith shape:** Oblong. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral slightly concave. **Dorsal margin:** Approximately flattened; **sculpture**, irregular. **Ventral margin:** Slightly rounded, notched and irregular. **Posterior margin:** Rounded and notched, serrate and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior slightly raised, posterior colliculum indistinct. **Pseudocolliculum:** Absent. **Ostium:** Approximately oval. **Cauda:** Sinuous, walls steep, narrow and deep at flexion, tip recurved. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.6. **Collum:** Absent, step up to cauda. **Crista superior:** Poorly developed over ostium, well developed over anterior cauda, ridge-like from mid-cauda to tip. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Oval, small and deep. **Ventral depression:** Absent, margin depressed and angled, posterior corner bulbous, depressed and with a diagonal groove. **Rostrum:** Short, broad and rounded. **Antirostrum:** Absent. **Excisura:** Moderately wide, notch absent.

***Liza dumerilii*, SSF No. 222.3 PLATE 110**

**DISTRIBUTION:** Senegal to southern Angola; in this area from Breede River to Bazaruto Is. Attains nearly 40 cm.

**MATERIAL:** 3/50 (4.1-9.49 mm OD, 87-274 mm SL), PEM 1049, 1047, 1164; Knysna and Swartkops; Id. HMK, GJBR.

**Otolith shape:** Oblong. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral slightly concave. **Dorsal margin:** Slightly rounded or flattened becoming emarginate with growth; **sculpture**, irregular. **Ventral margin:** Slightly rounded and irregular. **Posterior margin:** Rounded and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, slightly raised colliculi. **Pseudocolliculum:** Absent. **Ostium:** Short, oval and dorsally flared. **Cauda:** Very slightly sinuous, narrow, steep walled, flexed and strongly recurved tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:3.5, 1:3, 1:2.8. **Collum:** Absent, slight step to cauda. **Crista superior:** Poorly developed over ostium, ridge-like along cauda to flexion, well developed at tip. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Oval, dorsal area reduced becomes eroded. **Ventral depression:** Absent, margin depressed. **Rostrum:** Short, broad and sharply rounded. **Antirostrum:** Absent or minute and sharply rounded. **Excisura:** Moderately wide, notch very shallow if present, angle wide.

***Liza macrolepis*, SSF No. 222.5 PLATE 111**

**DISTRIBUTION:** Indo-West Pacific, most abundant mullet in Mozambique and Natal, reaches Port Alfred. Attains 35 cm.

**MATERIAL:** 3/7 (7.0-7.92 mm OD, 225-263 mm TL), PEM 1039, 1022, 1038; Swartkops estuary; Id. HMK.

**Otolith shape:** Oblong. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded or flat, may be slightly emarginate posteriorly; **sculpture**, crenate and irregular. **Ventral margin:** Slightly rounded and digitate and very irregular. **Posterior margin:** Rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, colliculi indistinct. **Pseudocolliculum:** Absent. **Ostium:** Moderately long, deeper than cauda, flared dorsally. **Cauda:** Slightly sinuous, narrow, flexed and slightly recurved at tip, walls steep. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.8, 1:1.6, 1:1.7. **Collum:** Absent, step up to cauda. **Crista superior:** Poorly developed over anterior ostium, well developed along cauda except for short ridge in mid-cauda. **Crista inferior:** Poorly developed under anterior ostium well developed elsewhere. **Dorsal depression:** Oval, small and deep. **Ventral depression:** Absent, margin depressed and angled, especially below caudal tip. **Rostrum:** Short, broad and sharply rounded. **Antirostrum:** Minute and sharply rounded. **Excisura:** Moderately wide, notch very shallow, angle wide.

***Liza richardsonii*, SSF No. 222.7 PLATE 111**

**DISTRIBUTION:** Known only from Kunene River to St Lucia, abundant between southwest Cape and Agulhas. Attains 40 cm.

**MATERIAL:** 4/82 (3.0-10.5 mm OD, 79-371 mm TL), PEM 1499, 10422, 10418, 2434; Cape south coast; Id. HMK, MJS.

**Otolith shape:** Oblong. **Thickness:** Moderate becoming moderately thick with growth. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded or flat; **sculpture**, crenate or irregular. **Ventral margin:** Slightly rounded, crenate or irregular. **Posterior margin:** Rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, colliculi very low. **Pseudocolliculum:** Absent. **Ostium:** Short and flared. **Cauda:** Sinuous, narrow, walls steep, flexed and recurved at tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:2.4, 1:2.9, 1:2.5, 1:3.6. **Collum:** Absent. **Crista superior:** Poorly developed over anterior ostium, well developed along cauda but ridge-like in mid-cauda. **Crista inferior:** Poor under ostium, well developed along cauda. **Dorsal depression:** Oval, becoming deeper with growth. **Ventral depression:** Absent,



margin depressed. **Rostrum:** Short, broad and pointed or rounded. **Antirostrum:** Small and pointed. **Excisura:** Moderate, notch shallow, angle wide.

***Liza tricuspidens*, SSF No. 222.8 PLATE 111**

**DISTRIBUTION:** Known only from Mossel Bay to Kosi Estuary (also recorded from Angola). Attains 75 cm.

**MATERIAL:** 5/70 (3.73-10.44 mm OD, 123-540 mm TL), PEM 1522, 9933, 10425, 2264, 1441; southeastern Cape; Id. HMK, MJS.

**Otolith shape:** Oblong. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave, almost flat in juveniles (c. 4 mm OD). **Dorsal margin:** Slightly rounded or flat; **sculpture**, crenate and irregular. **Ventral margin:** Slightly rounded and irregular. **Posterior margin:** Rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, slightly raised colliculi. **Pseudocolliculum:** Absent. **Ostium:** Moderately deep, short and narrow, walls almost horizontal, ostium only slightly wider than cauda. **Cauda:** Slightly sinuous, walls steep; tip flexed, becoming right-angled (c. 10 mm OD). **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:3.0, 1:2.1, 1:2.3, 1:2.9, 1:2.7. **Collum:** Absent, step up to cauda. **Crista superior:** Well developed above ostium and posterior cauda, low ridge above mid-cauda. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Oval and moderately deep. **Ventral depression:** Absent, margin depressed and angled. **Rostrum:** Short, broad and sharply rounded or blunt. **Antirostrum:** Minute and pointed. **Excisura:** Moderately wide, notch very shallow, angle acute.

***Mugil cephalus*, SSF No. 222.10 PLATE 111**

**DISTRIBUTION:** In all warm and temperate seas, estuaries and rivers. Attains 60 cm

**MATERIAL:** 6/56 (2.1-13.0 mm OD, 55-736 mm TL), PEM 1503, 1050, 1659, 3872, 2389, 10348; Cape south coast estuaries; Id. HMK, MJS.

**Otolith shape:** Oblong. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded or flat; **sculpture**, irregular. **Ventral margin:** Slightly rounded or emarginate, serrate or irregular. **Posterior margin:** Rounded or blunt and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, slightly raised anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Oval, flares widely dorsally, ventral wall bulges ventrally. **Cauda:** Approximately straight, slight ventral flexion along the length. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:2.5, 1:2.1, 1:1.9, 1:1.8, 1:1.7, 1:2.5. **Collum:** Absent, slight step may be present. **Crista superior:** Very poorly developed over ostium, well developed over posterior cauda, ridge-like along mid-cauda. **Crista inferior:** Poor under ostium, well developed along cauda. **Dorsal depression:** Oval and elongate, deepening with growth. **Ventral depression:** Absent, margin depressed and angled. **Rostrum:** Short, broad and pointed (<4 mm OD) becoming sharply rounded. **Antirostrum:** Minute and rounded. **Excisura:** Moderately wide, notch very shallow, angle wide.

***Myxus capensis*, SSF No. 222.11 PLATE 111**

**DISTRIBUTION:** Known only from Knysna to Natal, mainly in rivers. Attains nearly 50 cm.

**MATERIAL:** 5/17 (6.4-12.25 mm OD, 225-482 mm TL), PEM 1154, 1150, 0769, 1210, 2531; Cape south Coast estuaries; Id. HMK, MJS.

**Otolith shape:** Oval to oblong. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded or slightly emarginate; **sculpture**, slightly irregular. Ven-

tral margin: Rounded, digitate, dentate or irregular. **Posterior margin:** Rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior colliculum slightly raised, posterior indistinct. **Pseudocolliculum:** Absent. **Ostium:** Wide, flared, short and rounded. **Cauda:** Sinuate to strongly sinuate, walls steep, flexed tip may be strongly recurved. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:3.5, 1:3.3, 1:3.4, 1:3.1, 1:3.4. **Collum:** Absent, may be a step to cauda. **Crista superior:** Poorly developed above ostium, well developed over posterior cauda, ridge-like in mid-cauda. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Oval, moderately deep. **Ventral depression:** Absent, ventral margin depressed and angled, may be a posterior groove behind caudal tip in large otoliths (c. 12 mm OD). **Rostrum:** Short, broad and sharply rounded. **Antirostrum:** Minute or small and pointed. **Excisura:** Moderately wide, notch very shallow, angle acute.

***Valamugil buehanani*, SSF No. 222.12 PLATE 112**

**DISTRIBUTION:** Widespread and abundant in warm waters of Indo-West Pacific south to Knysna. Attains 100 cm.

**MATERIAL:** 2/2 (10.6, 11.12 mm OD, 484, 566 mm TL), PEM 6500, 2825; Kosi Bay and Bluewater Bay; Id. RvdE, MJS.

**Otolith shape:** Oblong. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded, emarginate in centre, raised anterior and posterior; **sculpture**, irregular. **Ventral margin:** Slightly rounded and notched, irregular. **Posterior margin:** Sharply rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, raised anterior colliculum, indistinct posterior. **Pseudocolliculum:** Absent. **Ostium:** Moderately elongate, deeper than cauda, margins irregular. **Cauda:** Narrow, sinuous, gently flexed posteriorly, walls steep. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:3.1, 6500 broken. **Collum:** Absent, step present. **Crista superior:** Poorly developed over ostium, ridge-like from neck to caudal tip. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Small, dorsal area very reduced and narrow. **Ventral depression:** Absent, margin sharply depressed, like step. **Rostrum:** Short, broad and rounded. **Antirostrum:** Very small and rounded. **Excisura:** Moderate, notch shallow, angle wide.

***Valamugil robustus*, SSF No. 222.14 PLATE 112**

**DISTRIBUTION:** Transkei to Inhambane and Madagascar, common in Mozambique. Attains 30 cm.

**MATERIAL:** 1/1 (7.88 mm OD, 255 mm TL), PEM 8239 (RUSI 37467); Kosi Bay; Id. MJS.

**Otolith shape:** Oblong. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral slightly concave. **Dorsal margin:** Angled and emarginate, raised anteriorly and posteriorly; **sculpture**, slightly irregular. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, slightly raised anterior colliculum, posterior indistinct. **Pseudocolliculum:** Absent. **Ostium:** Moderately shallow, short and flares dorsally, dorsal wall steep. **Cauda:** Approximately straight, flexed near tip with steep walls. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:2.3. **Collum:** Absent, with slight step. **Crista superior:** Poorly developed over ostium, ridge-like along cauda to flexion, well developed after flexion. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Oval. **Ventral depression:** Absent, margin angled and depressed. **Rostrum:** Short, broad and pointed. **Antirostrum:** Small and sharply rounded. **Excisura:** Moderately wide, notch shallow, angle wide.



**Valamugil seheli, SSF No. 222.15 PLATE 112**

**DISTRIBUTION:** Indo-West Pacific south to Transkei, common in southern Mozambique estuaries. Attains 50 cm.

**MATERIAL:** 3/3 (7.0-9.46 mm OD, 225-364 mm TL), 1167H, 1166H, 1055H; Gulf of Aqaba; Id. IP.

**Otolith shape:** Oblong. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Emarginate in centre, raised anteriorly and posteriorly; **sculpture**, slightly irregular. **Ventral margin:** Slightly rounded, notched and irregular. **Posterior margin:** Rounded, crenate, lobed or irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior colliculum low, posterior indistinct. **Pseudocolliculum:** Absent. **Ostium:** Oval, flaring, deep, ends in a V-shape posteriorly. **Cauda:** Slightly sinuate, slightly flexed, walls steep, tip may be sharp and recurved. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.9, 1:1.6, 1:1.8. **Collum:** Absent, marked step up to cauda. **Crista superior:** Well developed over ostium and tip of cauda, low ridge along most of cauda. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Elongate, dorsal area reduced and narrow. **Ventral depression:** Absent, margin sharply depressed. **Rostrum:** Short, broad and sharply rounded. **Antirostrum:** Minute and pointed. **Excisura:** Moderately wide, notch shallow, angle acute.

**SPHYRAENIDAE Nelson No. 356**

**Family characteristics:** Five species described. Otoliths oblong up to at least 15 mm OD. Heterosulcoid with ostial opening. Ostium oval to spear-shaped, cauda straight, may have very slight flexion at tip. Heteromorph, anterior colliculum low to indistinct, posterior very low to indistinct. Cristae usually moderately well developed but may be ridge-like along most of cauda.

**Key**

- 1a. Otoliths narrow and elongate; crista superior poorly developed over ostium . . . . . 2
- 1b. Otoliths broad, oblong; crista superior moderately well developed over ostium . . . . . 3
- 2a. Dorsal margin of otolith crenate; rostrum moderately long; ventral constriction in neck of sulcus indistinct; papilla-like groove at caudal tip absent or minute . . . . . *Sphyraena acutipinnis* 224.1
- 2b. Dorsal margin of otolith slightly crenate; rostrum shorter; ventral constriction in neck of sulcus marked; small papilla-like groove at caudal tip moderately distinct . . . . . *Sphyraena chrysotaenia* 224.4
- 3a. Ostium wide; caudal tip flexed and close to posterior margin; ventral margin of ostium poorly defined, curved dorsally on rostrum; rostrum short and broad . . . . . *Sphyraena flavicauda* 224.5
- 3b. Ostium moderately wide; cauda straight or slightly flexed at tip; ventral margin of ostium moderately well defined, approximately horizontal; rostrum broad to elongate . . . . . 4
- 4a. Antirostrum elongate, curved ventrally and narrow; ostium with slit or groove under antirostrum; ventral margin of ostium approximately straight, reaches margin at or just under tip of rostrum . . . *Sphyraena forsteri* 224.6
- 4b. Antirostrum not elongate, ventrally curved and narrow; groove under antirostrum absent or very indistinct; ventral margin of ostium curved, meets margin dorsal to tip of rostrum . . . . . 5
- 5a. Ostium broad, elongate and deep; cauda slightly flexed at tip; antirostrum small and sharply rounded or pointed, has groove at margin . . . . . *Sphyraena jello* 224.7

- 5b. Ostium moderately elongate, flared dorsally; cauda straight, slightly waisted then flared at tip, not flexed; antirostrum very short . . . *Sphyraena putnamiae* 224.9

***Sphyraena acutipinnis*, SSF No. 224.1 PLATE 112**

**DISTRIBUTION:** Indo-Pacific from Hawaii and French Polynesia to Japan, Philippines and northern Australia to South Africa as far south as Mossel Bay (34°S, 22°E). Attains 80 cm.

**MATERIAL:** 4/95 (3.5-8.2 mm OD, 91-270 mm TL), PEM 7233 (RUSI 28456), 3594, 13444, 6700 (RUSI 28456), [6703 (RUSI 28456), 8853 & 8854 (both RUSI 37484)]; ORI and Cape south coast; Id. PCH, MJS, RvdE.

**Otolith shape:** Oblong. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Slightly rounded; **sculpture**, crenate. **Ventral margin:** Slightly rounded and slightly crenate. **Posterior margin:** Rounded or blunt and crenate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior colliculum raised, indistinct posterior. **Pseudocolliculum:** Absent. **Ostium:** Elongate, fairly narrow. **Cauda:** Straight, steep walled, very slightly flexed at tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.1, 1:1, 1:1, 1:1.2. **Collum:** Absent, slight step up to cauda. **Crista superior:** Very poorly developed above ostium, ridge-like from neck to flexion, poorly developed at tip. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Elongate and oval. **Ventral depression:** Absent, shallow groove may be present on large otoliths from ostium to caudal tip near mid-area. **Rostrum:** Large, elongate and pointed. **Antirostrum:** Small and sharply rounded or pointed. **Excisura:** Moderately wide, notch shallow, angle acute.

***Sphyraena chrysotaenia*, SSF No. 224.4 PLATE 112**

**DISTRIBUTION:** Throughout central and western Indo-Pacific; Natal and south to East London, 33°S. Attains 30 cm.

**MATERIAL:** 2/3 (7.7, 9.0 mm OD, 260, 262 mm TL), PEM 12448, 12449; southeast Cape coast; Id. MJS.

**Otolith shape:** Oblong. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Slightly rounded; **sculpture**, slightly crenate. **Ventral margin:** Rounded and approximately entire. **Posterior margin:** Rounded or blunt and slightly crenate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, colliculi slightly raised. **Pseudocolliculum:** Absent. **Ostium:** Elongate, narrow, dorsal wall poorly defined. **Cauda:** Approximately straight, tip slightly flexed and walls steep. Short papilla-like groove at tip of cauda. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.2, 1:1. **Collum:** Absent, step present to cauda. **Crista superior:** Poorly developed above ostium and after flexion, ridge-like from neck to flexion. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Elongate and oval. **Ventral depression:** Absent, wide, shallow groove from tip of cauda to tip of rostrum near margin. **Rostrum:** Moderate, broad and sharply rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Moderately wide, notch shallow, angle acute.

***Sphyraena flavicauda*, SSF No. 224.5 PLATE 112**

**DISTRIBUTION:** Throughout western and central Indo-Pacific, south to Durban. Attains 37 cm.

**MATERIAL:** 1/1 (6.7 mm OD, 295 mm TL), PEM 14550 (RUSI 31426); Mauritius; Id. MJS, PCH.

**Otolith shape:** Oblong, broad and squat. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Slightly rounded; **sculpture**, crenate. **Ventral margin:** Slightly rounded and slightly crenate. **Posterior margin:**



Oblique, sharply rounded and crenate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, colliculi indistinct, particularly anterior. **Pseudocolliculum:** Absent. **Ostium:** Short, broad and oval, walls poorly defined. **Cauda:** Straight, flexed at tip, steep walls but posterior wall poorly defined. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.4. **Collum:** Absent, slight step to cauda. **Crista superior:** Moderately well developed above ostium and after flexion, ridge-like along cauda. **Crista inferior:** Poorly developed under anterior ostium, well developed elsewhere. **Dorsal depression:** Oval and elongate. **Ventral depression:** Absent, very shallow groove from tip of cauda to mid-ostium near margin. **Rostrum:** Short, broad and rounded. **Antirostrum:** Moderate and sharply rounded. **Excisura:** Moderately wide, notch shallow, angle acute.

*Sphyraena forsteri*, SSF No. 224.6 PLATE 112

**DISTRIBUTION:** Indo-Pacific, extending south to Bazaruto, Mozambique (21°S, 36°E), not reported from South Africa. Attains 65 cm.

**MATERIAL:** 2/2 (9.26, 10.0 mm OD, 420, 442 mm TL), PEM 15774, 15773; Comoro Ids; Id. MJS, PCH.

**Otolith shape:** Oblong. **Thickness:** Moderately thin. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded or slightly peaked; **sculpture**, slightly crenate or slightly irregular. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Obliquely rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, colliculi indistinct, particularly posterior. **Pseudocolliculum:** Absent. **Ostium:** Elongate, crista inferior approximately straight, reaches otolith margin just below rostral tip. Groove or slit under antirostrum. **Cauda:** Approximately straight, dorsal part of tip curved, ventrally flattened. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:0.8, 1:0.8. **Collum:** Absent, slight step to cauda. **Crista superior:** Poorly developed over anterior ostium, ridge-like from neck along cauda, well developed at tip. **Crista inferior:** Low ridge under ostium, well developed elsewhere. **Dorsal depression:** Elongate. **Ventral depression:** Shallow, from ostium to cauda in mid-area, where there may be a shallow groove. **Rostrum:** Elongate, tapered and pointed. **Antirostrum:** Elongate, narrow and pointed. **Excisura:** Moderately wide, notch shallow, unless joined by groove, angle acute.

*Sphyraena jello*, SSF No. 224.7 PLATE 113

**DISTRIBUTION:** Appears to be restricted to western Indian Ocean. Common in Natal, penetrating as far south as Knysna (33°35'S). Attains 125 cm.

**MATERIAL:** 3/7 (2.5-15.3 mm OD, c. 70-1900 mm TL), PEM 0081, 0402, 8142; Kosi Bay, Durban; Id. RvdE, MJS.

**Otolith shape:** Oval (c. 2.5 mm OD) becoming oblong with growth. **Thickness:** Moderately thin. **Form:** - Mesial convex, - Lateral slightly concave. **Dorsal margin:** Slightly rounded; **sculpture**, slightly irregular. **Ventral margin:** Slightly rounded and slightly irregular becoming more crenate with growth. **Posterior margin:** Rounded or sharply rounded and crenate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior and posterior colliculi low. **Pseudocolliculum:** Absent. **Ostium:** Oval, spear-shaped, irregular on rostral edge. **Cauda:** Approximately straight with steep walls, very slightly flexed dorsal wall. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1, 1:0.9, 8142 broken. **Collum:** Absent, step up to cauda. **Crista superior:** Moderately well developed over ostium and caudal tip, ridge-like from neck to flexion although ridge shorter in large specimens (c. 15 mm OD). **Crista inferior:** Moderately well developed along entire sulcus. **Dorsal depression:** Oval and shallow, becoming very shallow in large specimens (c. 15 mm OD). **Ventral depression:** Absent, two

grooves, the one nearest margin becoming deep in large otoliths. **Rostrum:** Large and sharply rounded. **Antirostrum:** Small and pointed. **Excisura:** Moderately wide, notch shallow, angle acute.

*Sphyraena putnamiae*, SSF No. 224.9 PLATE 113

**DISTRIBUTION:** Tropical Indo-Pacific from French Polynesia and Philippines to Red Sea and Natal. Attains 87 cm.

**MATERIAL:** 1/1 (8.7 mm OD, 253 mm TL), PEM 6652; ORI; Id. RvdE.

**Otolith shape:** Oblong. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Lateral surface:** Lateral ventral margin rounded and thick. **Dorsal margin:** Slightly rounded; **sculpture**, approximately entire. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Oblique and sharply rounded, slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, very low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Oval, flared dorsally. **Cauda:** Straight, slightly waisted near tip, walls steep. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** c. 1:1 (tip broken). **Collum:** Absent, step present. **Crista superior:** Moderately well developed over ostium and caudal tip, ridge-like from neck to 'waist'. **Crista inferior:** Moderately well developed along entire sulcus. **Dorsal depression:** Oval. **Ventral depression:** Absent, very shallow groove from mid-ostium to tip in mid-area. **Rostrum:** Large, broad. **Antirostrum:** Short and sharply rounded. **Excisura:** Moderately wide, notch very shallow, angle acute.

POLYNEMIDAE Nelson No. 357

**Family characteristics:** Three species described. Otoliths oblong, approximately oval, or oblong to rectangular, up to at least 8 mm OD. Heterosulcoid with ostial openings. Cauda straight with rounded, flexed, flared and deep tip. Heteromorph, colliculi low, may be distinct, anterior colliculum usually protrudes through excisura. Cristae well developed, but with ridge over most of cauda and sometimes over ostium.

Key

- 1a. Otolith approximately oblong to rectangular; rostrum broad, squared and blunt; ventral margin flat . . . . .  
Polydactylus sp. 223.-
- 1b. Otolith approximately oval to oblong; rostrum short and blunt or rounded; ventral margin rounded or slightly rounded . . . . . 2
- 2a. Otolith approximately oval; caudal tip rounded with deep pit; posterior margin of otolith rounded or oblique; crista superior above ostium well developed to ridge-like . . . . . Polydactylus sextarius 223.3
- 2b. Otolith approximately oblong; caudal tip flexed and flared but without deep pit; otolith tapers slightly posteriorly; posterior margin of otolith blunt and notched; crista superior above ostium poorly developed . . . . . Polydactylus plebeius 223.2

*Polydactylus plebeius*, SSF No. 223.2 PLATE 113

**DISTRIBUTION:** Indo-West Pacific from Red Sea to Knysna. Attains 30 cm.

**MATERIAL:** 2/3 (3.9, 4.0 mm OD, 167, 180 mm TL), 1377H, 1378H; Fish River mouth; Id. PCH.

**Otolith shape:** Oblong. **Thickness:** Moderately thin. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded; **sculpture**, crenate or irregular. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Blunt, notched and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Flared dorsally, colliculum protrudes



through excisura. **Cauda:** Straight, flexed, deeper and broader at tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.4, 1:1.3. **Collum:** Absent. **Crista superior:** Moderately well developed over ostium and after flexion, ridge-like along cauda. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Oval and elongate, covering most of dorsal area. **Ventral depression:** Absent. **Rostrum:** Short, broad and blunt. **Antirostrum:** Minute and rounded. **Excisura:** Moderately wide, notch very shallow, angle wide.

*Polydactylus sextarius*, SSF No. 223.3 PLATE 113

**DISTRIBUTION:** Indo-West Pacific, reaches Algoa Bay. Attains 30 cm.

**MATERIAL:** 7/10 (2.75-6.84 mm OD, 74-216 mm TL), PEM 15281 (RUSI 36871), 0134, 15279 & 15280 (both RUSI 36871), 6618 (RUSI 28494), 1691, 1690; Durban and Tugela Bank, Natal; Id. MJS, PCH, GJBR.

**Otolith shape:** Approximately oval. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Slightly rounded; **sculpture,** crenate or irregular. **Ventral margin:** Rounded becoming slightly rounded and slightly irregular. **Posterior margin:** Rounded or oblique, lobed and crenate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, both colliculi low. **Pseudocolliculum:** Absent. **Ostium:** Flared, colliculum protrudes through excisura. **Cauda:** Straight in anterior, slightly flared in middle, deeper, flared and flexed at circular tip. **Ostio-caudal differentiation:** Mainly dorsally constricted. **Ostium/cauda:** 1:1.5, 1:2.1, 1:1.7, 1:1.6, 1:1.7, 1:1.7, 1:1.8. **Collum:** Absent, step up to cauda. **Crista superior:** Ridge-like from ostium to flexion, well developed after flexion. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Oval and elongate. **Ventral depression:** Slight depression near caudal tip. May be shallow groove close to ventral margin. **Rostrum:** Short, broad and rounded. **Antirostrum:** Minute, sharply rounded. **Excisura:** Moderately wide, notch very shallow, angle wide.

*Polydactylus sp.*, SSF No. 223.— PLATE 113

**DISTRIBUTION:** Collected from Mauritius. Attains at least 357 mm TL.

**MATERIAL:** 1/1 (7.8 mm OD, 357 mm TL), PEM 14531; Mauritius; Id. MJS. NOTE: Specimen lost, specific identification not presently possible but otoliths distinctly different from others described here.

**Otolith shape:** Approximately oblong to rectangular. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Lateral surface:** Indented in centre. **Dorsal margin:** Slightly rounded or flat; **sculpture,** slightly irregular. **Ventral margin:** Approximately flat, crenate. **Posterior margin:** Tapered, slightly pointed and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, colliculi low. **Pseudocolliculum:** Absent. **Ostium:** Flares, ventral margin sinuous, dorsal wall of ostium undercuts dorsal area. **Cauda:** Slightly sinuous, deeper, flared and right-angled flexion at tip. **Ostio-caudal differentiation:** Dorsally constricted. **Ostium/cauda:** 1:1.8. **Collum:** Absent. **Crista superior:** Ridge-like to flexion, well developed at tip. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Oval and elongate. **Ventral depression:** Absent. **Rostrum:** Large, very broad and tip squared. **Antirostrum:** Large and pointed. **Excisura:** Moderately wide, notch moderately shallow, angle acute.

**Family characteristics:** Otoliths usually small, up to c. 4 mm OD, but largest individuals of a few species to at least 12 mm OD. Otoliths oblong to fusiform, obovate, anvil-shaped and heterosulcoid. Openings ostial, ostio-pseudocaudal or ostio-caudal which often progress through that sequence intraspecifically with growth. This makes construction of a key particularly difficult although, with adequate material, the species should be distinguishable. Sulcus may be shallow or deep and cauda usually slightly flexed, flared and rounded if not yet open. Heteromorph, colliculi usually low or indented with raised margins but may be indistinct and difficult to see. Cristae usually well developed along the sulcus but usually ridge-like over neck.

**Key**

- 1a. Otolith shape approximately discoid . . . . . 2
- 1b. Otolith shape oval, obovate, oval-ovate or approximately fusiform (not discoid) . . . . . 3
- 2a. Dorsal margin of otolith slightly rounded; ventral margin rounded; ventral and posterior margins of otolith depressed; sulcus wide; colliculi depressed, ventral margin of colliculi may be raised . . . . . *Cymolutes praetextatus* 220.24
- 2b. Dorsal margin of otolith rounded and raised; ventral margin well rounded; ventral and posterior margins of otolith not depressed; sulcus narrow; colliculum depressed, margins may be raised . . . *Xyrichtys pavo* 220.67
- 3a. Otolith approximately oblong to fusiform, tapering and pointed; sulcus deep; dorsal area narrow; dorsal depression usually distinct; colliculi usually distinct; dorsal margin of otolith flattened, emarginate or slightly rounded; antirostrum reduced or relatively narrow . . . 4
- 3b. Otolith shape obovate or ovate; sulcus relatively shallow; dorsal area relatively wide; dorsal depression usually shallow; colliculi low, depressed or slightly raised; dorsal margin rounded or raised; antirostrum broad or reduced, rarely narrow . . . . . 8
- 4a. Ventral margin of otolith slightly rounded; colliculi depressed with raised margins; rostrum very short . . . . . 5
- 4b. Ventral margin of otolith approximately flat; colliculi low, no raised margins; rostrum elongate or broad and pointed . . . . . 6
- 5a. Ostium relatively narrow; dorsal area of otolith relatively broad; ventral area relatively narrow; ventral wall of cauda approximately straight; ventral area does not bulge into anterior cauda; ventral margin of caudal tip not distinctly bulbous ventrally. . . . . *Bodianus bilunulatus* 220.7
- 5b. Ostium relatively broad, dorsal area of otolith relatively narrow; ventral area relatively broad, bulges up into anterior cauda; ventral wall of cauda flexed ventrally; ventral margin of caudal tip bulbous ventrally . . . . . *Bodianus perditio* 220.10
- 6a. Rostrum broad and blunt; antirostrum short and broad; dorsal area of otolith wide; dorsal margin of otolith rounded; margins of otolith very irregular or digitate; dorsal depression absent . . . *Cheilinus undulatus* 220.16
- 6b. Rostrum and antirostrum similar sized; dorsal margin of otolith flattened or emarginate; margins of otolith irregular crenate or lobed; dorsal depression oval, elongate and shallow . . . . . 7



- 7a. Cauda deep, flared and ventrally flexed; dorsal area of otolith reduced with narrow, rugose depression; dorsal margin of otolith flat to emarginate; colliculi indistinct, excisura with deep notch . . . . . *Anchichoerops natalensis* 220.4
- 7b. Cauda relatively shallow, gently flexed; dorsal margin of otolith slightly rounded or flat; anterior colliculum distinct, may penetrate excisura . . . *Cheilio inermis* 220.17
- 8a. Rostrum and antirostrum approximately equal in length and width, both may be short and reduced or relatively long . . . . . 9
- 8b. Rostrum larger, longer and broader than antirostrum . . . . . 13
- 9a. Rostrum reduced and small; excisural notch shallow . . . . . 10
- 9b. Rostrum relatively large, or short and broad; excisural notch moderately deep . . . . . 12
- 10a. Posterior margin of otolith rounded; ventral and posterior margins very irregular to digitate; ventral area of otolith with three grooves; crista inferior broad under neck . . . . . *Epibulus insidiator* 220.26
- 10b. Posterior margin of otolith tapered and sharply rounded; ventral and posterior margins of otolith slightly irregular or crenate; ventral area may have single groove; crista inferior well developed . . . . . 11
- 11a. Dorsal margin of otolith raised and rounded; crista superior ridge-like from ostium to mid-cauda; dorsal depression deep and elongate . . . *Bodianus diana* 220.8
- 11b. Dorsal margin of otolith rounded or slightly raised anteriorly; crista superior has short ridge over neck, well developed elsewhere; dorsal depression shallow and short . . . . . *Bodianus anthioides* 220.5
- 12a. Rostrum and antirostrum broad; rostrum approximately equal in size to antirostrum but may be slightly broader; posterior margin of otolith tapers : *Anampses caeruleopunctatus* 220.1, *Anampses meleagrides* 220.3
- 12b. Rostrum slightly more elongate than antirostrum; posterior margin of otolith tapered but slightly rounded; dorsal area less raised . . . . . *Anampses lineatus* 220.2
- 13a. Rostrum and antirostrum of similar length; excisural notch deep or moderate . . . . . 14
- 13b. Rostrum considerably broader and/or longer than antirostrum; excisural notch usually shallow . . . . . 17
- 14a. Rostrum and antirostrum relatively elongate; excisural notch deep; ventral margin of otolith approximately flat . . . . . 15
- 14b. Rostrum and antirostrum short; excisural notch relatively shallow (cf. 15); ventral margin of otolith slightly rounded . . . . . 16
- 15a. Cauda flared evenly; dorsal margin of otolith tapers posteriorly; dorsal area relatively narrower; dorsal depression elongate . . . *Stethojulis albovittata* 220.55
- 15b. Cauda paddle-shaped; dorsal margin of otolith slightly raised and rounded; dorsal area broad; dorsal depression small . . . . . *Stethojulis strigiventer* 220.57
- 16a. Otolith obovate; dorsal margin of otolith rounded; dorsal depression shallow; posterior margin tapered to rounded and slightly irregular . . . *Coris gaimard africana* 220.23
- 16b. Otolith approximately obovate; dorsal margin of otolith slightly rounded; dorsal depression relatively shallow; posterior margin of otolith notched and slightly irregular . . . . . *Thalassoma trilobatum* 220.65
- 16c. Otolith approximately obovate; dorsal margin of otolith rounded and irregular; dorsal depression elongate,

distinct and deep; posterior margin of otolith sharply rounded and very irregular . . *Cheilinus digrammus* 220.13

17. Rostrum large and broad; antirostrum small, may be tapered; cauda and posterior margin of otolith vary widely. A group of species with considerable intraspecific variation: *Coris aygula* 220.20, *C. caudimacula* 220.21, *Gomphosus caeruleus* 220.27, *Halichoeres cosmetus* 220.28, *H. hortulanus* 220.30, *Hemigymnus fasciatus* 220.36, *Hologymnosus doliatus* 220.38, *Labroides dimidiatus* 220.41, *Pseudocheilinus hexataenia* 220.48, *Pteragogus flagellifer* 220.52, *P. pelycus* 220.53, *Stethojulis interrupta* 220.56, *Thalassoma amblycephalum* 220.58, *T. hebraicum* 220.61, *T. lunare* 220.62, *T. purpureum* 220.63.

#### *Anampses caeruleopunctatus*, SSF No. 220.1 PLATE 113

DISTRIBUTION: Indo-Pacific from Red Sea and South Africa to Easter Id; juveniles reach Algoa Bay. Attains at least 40 cm.

MATERIAL: 3/3 (1.4-2.9 mm OD, 76-198 mm TL), PEM 2909, 6437, 5991; Sodwana Bay and environs; Id. GRA, PCH.

**Otolith shape:** Approximately obovate. **Thickness:** Moderately thick. **Form:** - Mesial slightly convex, - Lateral flat. **Dorsal margin:** Rounded; **sculpture**, entire becoming serrate. **Ventral margin:** Slightly rounded, serrate or crenate. **Posterior margin:** Pointed and slightly irregular. **Sulcus acusticus:** Ostio-caudal, heterosulcoid. **Colliculum:** Heteromorph, colliculi indistinct. **Pseudocolliculum:** Absent. **Ostium:** Flared, deep. **Cauda:** Narrow, flaring and deep posteriorly. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:2.3, 1:2.5, 1:3.4. **Collum:** Low. **Crista superior:** Well developed over ostium and posterior cauda, ridge-like over collum. **Crista inferior:** Well developed, may be ridge-like under collum, very poorly developed at extremes. **Dorsal depression:** Oval and shallow. **Ventral depression:** Absent. **Rostrum:** Short, broad and pointed. **Antirostrum:** Short, broad and pointed. **Excisura:** Wide, notch relatively deep, angle wide.

#### *Anampses lineatus*, SSF No. 220.2 PLATE 113

DISTRIBUTION: Red Sea and Indian Ocean, south to Natal. Attains 12 cm.

MATERIAL: 2/2 (1.5, 2.0 mm OD, 77, 103 mm TL), PEM 14800 (RUSI 31369), 14799 (RUSI 31376); St Lucia Marine Reserve; Id. PCH.

**Otolith shape:** Approximately obovate. **Thickness:** Moderately thick. **Form:** - Mesial slightly convex, - Lateral flat. **Dorsal margin:** Rounded; **sculpture**, slightly irregular. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Sharply rounded and slightly irregular. **Sulcus acusticus:** Ostial may appear ostio-pseudocaudal, heterosulcoid. **Colliculum:** Heteromorph, indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Flared, deep, walls very steep. **Cauda:** Flared, deep, posterior walls poorly defined, close to margin. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:2.2, 14799 broken. **Collum:** Low. **Crista superior:** Poorly developed over ostium, ridge-like over collum, very poorly developed at tip. **Crista inferior:** Poorly developed under ostium, well developed under collum, poorly developed at tip. **Dorsal depression:** Oval and elongate. **Ventral depression:** Absent. **Rostrum:** Large, broad and sharply rounded. **Antirostrum:** Moderately large, broad and sharply rounded. **Excisura:** Wide, notch deep, angle wide.

#### *Anampses meleagrides*, SSF No. 220.3 PLATE 114

DISTRIBUTION: Western Pacific to Red Sea and east Africa; south to Sodwana Bay. Attains 22 cm.



MATERIAL: 3/3 (1.6-2.4 mm OD, 84-135 mm TL), PEM 14801 (RUSI 31367), 14802 (RUSI 31375), 14803 (RUSI 31374); St Lucia Marine Reserve; Id. PCH.

**Otolith shape:** Approximately obovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral slightly concave. **Dorsal margin:** Rounded; sculpture, slightly irregular. **Ventral margin:** Slightly rounded, becoming flattened, crenate or irregular. **Posterior margin:** Sharply rounded and slightly irregular. **Sulcus acusticus:** Ostio-pseudocaudal (c. 1.6 mm OD) becoming ostio-caudal (c. 2.2 mm OD), heterosulcoid. **Colliculum:** Heteromorph, colliculi very low. **Pseudocolliculum:** Absent. **Ostium:** Flared, deep and walls poorly defined. **Cauda:** Narrow, deep, flaring posteriorly. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:2.0, 1:1.6, 1:2.8. **Collum:** Low. **Crista superior:** Poorly developed over ostium and posterior cauda, ridge-like over neck. **Crista inferior:** Well developed under collum, very poorly developed at extremes. **Dorsal depression:** Oval and shallow. **Ventral depression:** Absent. **Rostrum:** Short, broad and rounded. **Antirostrum:** Short, broad and rounded. **Excisura:** Wide, notch moderately deep, angle wide.

#### *Anchichoerops natalensis*, SSF No. 220.4 PLATE 114

DISTRIBUTION: Natal and Transkei. Attains 75 cm.

MATERIAL: 3/3 (2.85-8.3 mm OD, 8697 = 557 mm TL, others not measured), PEM 2776, 2168, 8697; ORI, Tongaat, Sodwana Bay; Id. MJS.

**Otolith shape:** Approximately oblong. **Thickness:** Moderate becoming thick (c. 8 mm OD). **Form:** - Mesial slightly convex, - Lateral flat. **Dorsal margin:** Slightly rounded or emarginate; sculpture, irregular. **Ventral margin:** Slightly rounded or flat and slightly irregular. **Posterior margin:** Pointed and oblique, lobed or irregular. **Sulcus acusticus:** Ostio-caudal, heterosulcoid. **Colliculum:** Heteromorph, indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Flared, very deep, walls steep. **Cauda:** Flared, deep, rounded and slightly flexed at tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.8, 1:2.1, 2776 broken. **Collum:** Low. **Crista superior:** Ridge-like from ostium to mid-cauda, absent at tip. **Crista inferior:** Well developed at neck, ridge-like at extremes. **Dorsal depression:** Slit-like above crista. **Ventral depression:** Absent, may be shallow groove in mid-ventral area. **Rostrum:** Large, elongate and pointed. **Antirostrum:** Large, elongate and pointed. **Excisura:** Wide, notch deep, angle acute.

#### *Bodianus anthioides*, SSF No. 220.5 PLATE 114

DISTRIBUTION: Indo-Pacific, Red Sea south to Sodwana Bay. Attains 21 cm.

MATERIAL: 1/1 (3.1 mm OD, 114 mm TL), PEM 8830 (RUSI 37439); Kosi Bay; Id. PCH.

**Otolith shape:** Approximately obovate. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral approximately flat. **Dorsal margin:** Rounded; sculpture, slightly crenate. **Ventral margin:** Slightly rounded and crenate. **Posterior margin:** Sharply rounded and crenate. **Sulcus acusticus:** Ostio-pseudocaudal, heterosulcoid. **Colliculum:** Heteromorph, very low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Flared, moderate deep and short. **Cauda:** Approximately straight, dorsal margin flared. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:2.3. **Collum:** Very low. **Crista superior:** Very poorly developed over anterior ostium and posterior cauda, ridge-like over collum. **Crista inferior:** Well developed along entire sulcus, poor at extremes. **Dorsal depression:** Oval and shallow. **Ventral depression:** Absent, very shallow and wide ventral groove in mid-ventral area. **Rostrum:** Short, broad and pointed. **Antirostrum:** Short and sharply rounded. **Excisura:** Moderately wide, notch moderately deep, angle wide.

#### *Bodianus bilunulatus*, SSF No. 220.7 PLATE 114

DISTRIBUTION: Indo-Pacific but distribution not continuous, south to Durban, Natal. Attains at least 55 cm.

MATERIAL: 4/15 (5.22-6.3 mm OD, 255,281 mm TL, 6589 & 0029 not measured), PEM 0029, 6589 (RUSI 28457), 8542 (RUSI 37482), 8535 (RUSI 34154), [9599 (RUSI 37510)]; Sodwana Bay, Kosi and ORI; Id. MJS, PCH, GJBR.

**Otolith shape:** Approximately oblong. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral approximately flat. **Dorsal margin:** Slightly rounded or raised; sculpture, crenate or irregular. **Ventral margin:** Slightly rounded, crenate or irregular. **Posterior margin:** Pointed and irregular. **Sulcus acusticus:** Ostio-pseudocaudal (<5 mm OD), becoming ostio-caudal (c. 5 mm OD), heterosulcoid. **Colliculum:** Heteromorph, very low colliculi with raised margins. **Pseudocolliculum:** Absent. **Ostium:** Flared, deep with steep dorsal margin. **Cauda:** Deep, flared and rounded posteriorly. **Ostio-caudal differentiation:** Slight ventral constriction. **Ostium/cauda:** 1:1.8, 1:2, 1:2, 1:2.1. **Collum:** Low. **Crista superior:** Ridge-like over ostium and collum or to caudal flare, usually well developed over cauda. **Crista inferior:** Moderately well developed under ostium, well developed elsewhere. **Dorsal depression:** Oval and elongate. **Ventral depression:** Absent, may be ventral groove. **Rostrum:** Short becoming moderate, broad and sharply rounded or pointed. **Antirostrum:** Small and sharply rounded or pointed. **Excisura:** Moderately wide, notch shallow, angle wide.

#### *Bodianus diana*, SSF No. 220.8 PLATE 114

DISTRIBUTION: Indo-Pacific, south to Transkei. Attains 25 cm.

MATERIAL: 4/9 (3.8-4.7 mm OD, 157-185 mm TL), PEM 4403, 8785, 6687 (RUSI 28458), 8792 (RUSI 37427), [6688 (RUSI 28458), 15470 (RUSI 40595)]; Kosi, ORI and Ledsman Shoal; Id. MJS, PCH.

**Otolith shape:** Approximately oval to elliptic. **Thickness:** Moderately thick. **Form:** - Mesial slightly convex, - Lateral approximately flat. **Lateral surface:** Slight ridge beneath excisura. **Dorsal margin:** Rounded and raised; sculpture, slightly irregular. **Ventral margin:** Slightly rounded and crenate. **Posterior margin:** Tapering and sharply rounded to pointed and irregular. **Sulcus acusticus:** Ostial becoming ostio-pseudocaudal (c. 4.5 mm OD), heterosulcoid. **Colliculum:** Heteromorph, colliculi very low. **Pseudocolliculum:** Absent. **Ostium:** Flared, moderately deep and blunt. **Cauda:** Flared, rounded posteriorly with posterior margin indistinct. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:2, 1:2.4, 1:2.3, 1:1.9. **Collum:** Indistinct and low. **Crista superior:** Ridge-like from ostium to mid-cauda, poorly developed over posterior cauda. **Crista inferior:** Well developed along sulcus. **Dorsal depression:** Elongate and oval. **Ventral depression:** Absent, may be a wide, shallow groove in mid-area. **Rostrum:** Very short and sharply rounded or blunt. **Antirostrum:** Small and sharply rounded. **Excisura:** Moderate, notch shallow, angle wide.

#### *Bodianus perditio*, SSF No. 220.10 PLATE 114

DISTRIBUTION: Anti-tropical in distribution, known from islands of southern Oceania, eastern Australia, Japan, Mauritius, Reunion, St Brandon Shoals, and northern Mozambique to Natal. Attains 80 cm.

MATERIAL: 4/6 (6.2-8.7 mm OD, 373-513 mm TL), PEM 5959, 9609, 9624, 8364; ORI, Ledsman Shoal and Zululand; Id. MJS.

**Otolith shape:** Approximately oblong to elliptic. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Lateral surface:** Ridge under postero-ventral corner. **Dorsal margin:** Rounded; sculpture, irregular. **Ventral margin:** Rounded and crenate or serrate. **Posterior margin:** Tapering,



pointed, digitate and very irregular. **Sulcus acusticus:** Ostio-caudal, heterosulcoid. **Colliculum:** Heteromorph, low colliculi, margins raised. **Pseudocolliculum:** Absent. **Ostium:** Flared, deep and floor irregular. **Cauda:** Narrow, straight, flares posteriorly and deep. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:2.2, 1:2.1, 1:1.8, 1:2.3. **Collum:** Absent, slight rise in neck area. **Crista superior:** Ridge-like from ostium to mid-cauda, well developed over posterior cauda. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Elongate and narrow. **Ventral depression:** Absent, may be a shallow groove. **Rostrum:** Very short and sharply rounded. **Antirostrum:** Very small and sharply rounded. **Excisura:** Moderate, notch very shallow, angle wide.

***Cheilinus digrammus*, SSF No. 220.13 PLATE 114**

**DISTRIBUTION:** Central Oceania to Red Sea and south to Natal. Attains 35 cm.

**MATERIAL:** 2/2 (5.0, 5.18 mm OD, 234, 239 mm TL), PEM 15696 (RUSI 42676), 1033H; Red Sea; Id. PCH, TH.

**Otolith shape:** Approximately obovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral slightly concave. **Dorsal margin:** Rounded; sculpture, crenate or very irregular. **Ventral margin:** Rounded, serrate or very irregular and digitate. **Posterior margin:** Rounded or sharply rounded, digitate or serrate. **Sulcus acusticus:** Ostio-pseudocaudal, heterosulcoid. **Colliculum:** Heteromorph, very low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Oval, deep and slightly flared. **Cauda:** Fairly elongate and flares posteriorly. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.1, 1:1.5. **Collum:** Narrow and low. **Crista superior:** Well developed or ridge-like over ostium, ridge-like over neck to mid-cauda, very poorly developed at tip. **Crista inferior:** Poorly developed under ostium, well developed under anterior cauda. **Dorsal depression:** Oval and deep. **Ventral depression:** Absent, groove may be present and area close to margin may be depressed. **Rostrum:** Large, moderately broad and sharply rounded. **Antirostrum:** Narrow, moderate and sharply rounded. **Excisura:** Moderate, notch deep, angle acute.

***Cheilinus undulatus*, SSF No. 220.16 PLATE 115**

**DISTRIBUTION:** Indo-Pacific, south to Inhaca Is. Reported to attain 2.29 m and 190 kg.

**MATERIAL:** 1/1 (12.1 mm OD, 1370 mm TL), PEM 8499; Europa Is.; Id. RvdE.

**Otolith shape:** Approximately oblong. **Thickness:** Moderately thick. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Rounded; sculpture, crenate or irregular. **Ventral margin:** Slightly rounded, digitate and very irregular. **Posterior margin:** Pointed, digitate and irregular. **Sulcus acusticus:** Ostio-caudal, heterosulcoid. **Colliculum:** Heteromorph, indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Flared, deep with steep walls. **Cauda:** Flared, very deep. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:1.5. **Collum:** Low and indistinct. **Crista superior:** Well developed along entire sulcus. **Crista inferior:** Ridge-like under ostium, well developed elsewhere. **Dorsal depression:** Absent. **Ventral depression:** Absent, may be a groove below crista. **Rostrum:** Moderate, broad and pointed. **Antirostrum:** Short, broad and rounded. **Excisura:** Wide, notch deep, angle acute.

***Cheilio inermis*, SSF No. 220.17 PLATE 115**

**DISTRIBUTION:** Indo-Pacific from Easter Is. to Red Sea, south to Transkei. Attains 50 cm.

**MATERIAL:** 5/5 (2.65-5.64 mm OD, 170-430 mm TL), PEM 5069 (RUSI 13765), 15421 (RUSI 40581), 1220H, 15420 (RUSI 40581), 1047H; Red Sea, Kenya and Bazaruto; Id. TH, MJS, PCH.

**Otolith shape:** Oblong to approximately fusiform. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Slightly rounded; sculpture, crenate. **Ventral margin:** Approximately flat and crenate. **Posterior margin:** Pointed, crenate to irregular. **Sulcus acusticus:** Ostial (<2.7 mm OD) becoming ostio-pseudocaudal, heterosulcoid. **Colliculum:** Heteromorph, with low but distinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Flared, deep and elongate. **Cauda:** Flared, deep with poorly defined posterior wall. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:0.9, 1:1, 1:1.1, 1:1.1, 1:1. **Collum:** Low, present only in small otoliths (<5 mm OD). **Crista superior:** Ridge-like over ostium and neck, poorly developed over cauda. **Crista inferior:** Well developed or a low ridge under collum, moderately well developed at extremes. **Dorsal depression:** Oval, elongate and shallow. **Ventral depression:** Absent, narrow, deep groove near crista. **Rostrum:** Large, elongate and sharply rounded. **Antirostrum:** Moderate and sharply rounded or rounded. **Excisura:** Moderately wide, notch deep, angle varies.

***Coris aygula*, SSF No. 220.20 PLATE 115**

**DISTRIBUTION:** Broadly distributed in the Indo-Pacific, south to Transkei. Attains at least 120 cm.

**MATERIAL:** 3/3 (1.8-4.3 mm OD, 113, 395 mm TL, 0048 not measured), PEM 0048, 8665 (RUSI 37452), 15566 (RUSI 42762); ORI and M'punda, Transkei; Id. PCH, GJBR.

**Otolith shape:** Approximately obovate. **Thickness:** Moderate. **Form:** - Mesial very slightly convex, - Lateral very slightly concave. **Dorsal margin:** Rounded; sculpture, slightly irregular. **Ventral margin:** Rounded and entire. **Posterior margin:** Sharply rounded and slightly irregular. **Sulcus acusticus:** Ostio-caudal or ostio-pseudocaudal, heterosulcoid. **Colliculum:** Heteromorph, indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Flared, with steep dorsal wall. **Cauda:** Flared, moderately deep and elongate. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:1.7, 1:2.8, 1:2.4. **Collum:** Low. **Crista superior:** Well developed at extremes, well developed over cauda, becoming ridge-like over cauda with growth. **Crista inferior:** Poorly developed becoming moderately well developed under sulcus (c. 2.2 mm OD). **Dorsal depression:** Oval and very shallow, deepening with growth. **Ventral depression:** Absent, shallow grooves across ventral area. **Rostrum:** Short, broad and rounded or pointed. **Antirostrum:** Small and rounded. **Excisura:** Moderate, notch very shallow, angle wide.

***Coris caudimacula*, SSF No. 220.21 PLATE 115**

**DISTRIBUTION:** Indian Ocean including Red Sea, south to East London. Attains c. 20 cm.

**MATERIAL:** 4/6 (1.6-2.5 mm OD, 73-148 mm TL), PEM 2910, 3913, 14798 (RUSI 31386), 4615; Ledsmans Shoal, off St Lucia and Sodwana; Id. PCH, GRA.

**Otolith shape:** Obovate. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Raised, rounded; sculpture, slightly irregular. **Ventral margin:** Rounded and crenate. **Posterior margin:** Sharply rounded and slightly irregular. **Sulcus acusticus:** Ostial or ostio-pseudocaudal, heterosulcoid. **Colliculum:** Heteromorph, colliculi very low. **Pseudocolliculum:** Absent. **Ostium:** Flared, moderately deep. **Cauda:** Flared, deep anteriorly, walls sinuous. **Ostio-caudal differentiation:** Slightly ventrally constricted. **Ostium/cauda:** 1:0.9, 1:1.3, 1:1.5, 1:1.3. **Collum:** Very low. **Crista superior:** Ridge-like over ostium and neck, moderately well developed over cauda. **Crista inferior:** Moderately well developed under sulcus. **Dorsal depression:** Elongate and shallow. **Ventral depression:** Absent, may be groove. **Rostrum:** Short, broad and rounded or sharply



rounded. **Antirostrum:** Small, broad and rounded. **Excisura:** Moderate, notch shallow, angle wide.

*Coris gaimard africana*, SSF No. 220.23 PLATE 115

**DISTRIBUTION:** This subspecies occurs only in the Western Indian Ocean (to 30°S in South African waters). Attains at least 35 cm.

**MATERIAL:** 2/2 (1.50, 1.51 mm OD, 66-82 mm TL), 0400H, 0401H; Kenya; Id. TH.

**Otolith shape:** Obovate. **Thickness:** Moderate. **Form:** - Mesial very slightly convex, - Lateral very slightly concave. **Dorsal margin:** Rounded; **sculpture**, entire. **Ventral margin:** Rounded, crenate or slightly irregular. **Posterior margin:** Sharply rounded and slightly irregular. **Sulcus acusticus:** Ostio-pseudocaudal, heterosulcoid. **Colliculum:** Heteromorph, colliculi depressed and slightly granular. **Pseudocolliculum:** Absent. **Ostium:** Flared, moderately deep. **Cauda:** Flared, deep. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1, 1:1.3. **Collum:** Low. **Crista superior:** Well developed over anterior ostium, ridge-like over posterior ostium and neck, poorly developed over posterior cauda. **Crista inferior:** Well developed under collum, moderately well developed at extremes. **Dorsal depression:** Oval and elongate. **Ventral depression:** Absent. **Rostrum:** Short, broad and rounded. **Antirostrum:** Small, broad and rounded. **Excisura:** Moderate, notch shallow, angle wide.

*Cymolutes praetextatus*, SSF No. 220.24 PLATE 115

**DISTRIBUTION:** Indo-Pacific; south to Natal. Attains 20 cm.

**MATERIAL:** 2/6 (2.75, 3.65 mm OD, 137, 160 mm TL), PEM 15417 & 15419 (both RUSI 40580), [15414-15416 & 15418 (all RUSI 40580)]; Bazaruto, Mozambique; Id. MJS, PCH.

**Otolith shape:** Discoid becoming ovate. **Thickness:** Thick. **Form:** - Mesial convex, - Lateral slightly concave. **Lateral surface:** Radiating, rounded ridges from nucleus. **Dorsal margin:** Slightly rounded or flattened; **sculpture**, slightly irregular. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Oblique to flattened, blunt or sharply rounded. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, ventral margin of indented colliculi raised. **Pseudocolliculum:** Absent. **Ostium:** Deep, moderately elongate, slightly flared dorsally. **Cauda:** Short and deep, slightly flexed at rounded tip. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:0.6, 1:0.7. **Collum:** Absent. **Crista superior:** Well developed along entire sulcus. **Crista inferior:** Well developed along entire sulcus, may be ridge-like at caudal tip. **Dorsal depression:** Absent, area may be slightly columnar. **Ventral depression:** Absent, margin depressed from mid-area to posterior margin, ventral margin below sulcus columnar. **Rostrum:** Short and rounded or tapering and pointed. **Antirostrum:** Small and rounded or sharply rounded. **Excisura:** Moderate, notch shallow, angle wide.

*Epibulus insidiator*, SSF No. 220.26 PLATE 115

**DISTRIBUTION:** Indo-Pacific, south to Delagoa Bay. Attains at least 35 cm.

**MATERIAL:** 1/1 (6.0 mm OD, 270 mm TL), PEM 15386 (RUSI 40606); Madagascar; Id. MJS, PCH.

**Otolith shape:** Oblong to ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Lateral surface:** V-shaped notch under ostium, filled with colliculum, elongate groove along midline. **Dorsal margin:** Slightly rounded and angled, tapering posteriorly; **sculpture**, slightly irregular. **Ventral margin:** Rounded, very irregular to digitate. **Posterior margin:** Sharply rounded, tapered, irregular to digitate. **Sulcus acusticus:** Ostio-pseudocaudal, heterosulcoid. **Colliculum:** Heteromorph, colliculi indistinct. **Pseudocolliculum:** Absent. **Ostium:** Deep, approximately oval, narrows slightly to excisura. **Cauda:** Almost straight,

deep posteriorly at rounded and flared tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:2.1. **Collum:** Low and elongate. **Crista superior:** Well developed over anterior ostium, ridge-like from posterior ostium to mid-cauda, moderately well developed over posterior cauda. **Crista inferior:** Ridge-like under ostium, broad ridge under neck, moderately well developed at tip. **Dorsal depression:** Elongate above neck. **Ventral depression:** Three depressions: A groove-like depression from rostrum to cauda in mid-area, one under crista under neck, and one depression under caudal tip to margin. **Rostrum:** Small and sharply rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Moderate, notch shallow, angle wide.

*Gomphosus caeruleus*, SSF No. 220.27 PLATE 116

**DISTRIBUTION:** Indian Ocean, south to southern Natal. Attains 28 cm.

**MATERIAL:** 2/2 (2.35, 3.0 mm OD, 126, 155 mm TL), 1215H, PEM 0449; ORI and Eilat; Id. TH, GJBR.

**Otolith shape:** Approximately obovate. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Raised; **sculpture**, irregular. **Ventral margin:** Rounded crenate or irregular. **Posterior margin:** Rounded, may be notched and irregular. **Sulcus acusticus:** Ostio-pseudocaudal (c. 2.4 mm OD) becoming ostio-caudal (>3 mm OD), heterosulcoid. **Colliculum:** Heteromorph, with low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Flared, moderately deep. **Cauda:** Straight, flared, ventrally bulbous and moderately deep. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.5, 1:1. **Collum:** Very low. **Crista superior:** Well developed over ostium and posterior cauda, ridge-like over neck. **Crista inferior:** Well developed under along entire sulcus. **Dorsal depression:** Long, oval and shallow. **Ventral depression:** Absent. **Rostrum:** Short, broad, pointed or rounded. **Antirostrum:** Small and pointed. **Excisura:** Moderate, notch shallow, angle wide.

*Halichoeres cosmetus*, SSF No. 220.28 PLATE 116

**DISTRIBUTION:** Western Indian Ocean to Aliwal Shoal south of Durban. Attains 11 cm.

**MATERIAL:** 2/2 (2.0, 2.25 mm OD, 89, 114 mm TL), PEM 14233 (RUSI 30626), 15451 (RUSI 40557); Sodwana and Comoro Ids; Id. MJS, PCH.

**Otolith shape:** Obovate. **Thickness:** Moderate. **Form:** - Mesial very slightly convex, - Lateral very slightly concave. **Dorsal margin:** Raised, rounded; **sculpture**, approximately entire. **Ventral margin:** Rounded and serrate. **Posterior margin:** Rounded and slightly irregular. **Sulcus acusticus:** Ostio-pseudocaudal, heterosulcoid. **Colliculum:** Heteromorph, very low, indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Short, flared and moderately deep. **Cauda:** Approximately straight, flared slightly and moderately deep. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:1.4, 1:2. **Collum:** Absent. **Crista superior:** Well developed over sulcus, absent at posterior tip. **Crista inferior:** Well developed along entire sulcus, absent at tip. **Dorsal depression:** Oval and very shallow, margin may be depressed. **Ventral depression:** Absent, may be shallow grooves in ventral area. **Rostrum:** Short, broad and sharply rounded. **Antirostrum:** Very small and rounded. **Excisura:** Moderate, notch very shallow, angle wide.

*Halichoeres hortulanus*, SSF No. 220.30 PLATE 116

**DISTRIBUTION:** Indo-Pacific; south to Sodwana Bay. Attains 26 cm.

**MATERIAL:** 4/6 (1.9-3.4 mm OD, 81-217 mm TL), PEM 14804 (RUSI 31370), 4401, 14797 (RUSI 31389), 8784, [8431 (RUSI



34158)); Kosi, St. Lucia Marine Reserve and Ledsman Shoal; Id. PCH, MJS.

**Otolith shape:** Obovate. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral approximately flat. **Dorsal margin:** Rounded; **sculpture,** slightly irregular. **Ventral margin:** Slightly rounded and serrate or irregular. **Posterior margin:** Rounded, may be notched and slightly irregular. **Sulcus acusticus:** Ostial (1.9 mm OD) becoming ostio-pseudocaudal (2.2 mm OD), then ostio-caudal (c. 3.4 mm OD), heterosulcoid. **Colliculum:** Heteromorph, colliculi very low. **Pseudocolliculum:** Absent. **Ostium:** Flared, short and moderately deep. **Cauda:** Flared, moderately deep. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1, 1:1.2, 1:1.6, 1:1.3. **Collum:** Very low and very short. **Crista superior:** Well developed over entire sulcus, may be ridge-like over neck. **Crista inferior:** Well developed under sulcus. **Dorsal depression:** Oval and shallow. **Ventral depression:** Absent. **Rostrum:** Short, broad and rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Moderate, notch very shallow, angle wide.

***Hemigymnus fasciatus*, SSF No. 220.36 PLATE 116**

**DISTRIBUTION:** Indo-Pacific, south to Inhaca Is. Reported to attain up to 80 cm, usually seen up to 40 cm.

**MATERIAL:** 1/1 (4.75 mm OD, 370 mm TL), 1053H; Red Sea; Id. TH.

**Otolith shape:** Obovate to anvil-shaped. **Thickness:** Moderately thick. **Form:** - Mesial slightly convex, - Lateral approximately flat. **Dorsal margin:** Raised and rounded; **sculpture,** irregular. **Ventral margin:** Slightly rounded and serrate. **Posterior margin:** Notched and irregular. **Sulcus acusticus:** Ostio-caudal, heterosulcoid. **Colliculum:** Heteromorph, raised, nodular colliculi. **Pseudocolliculum:** Absent. **Ostium:** Flared, very deep with steep walls and mainly on rostrum. **Cauda:** Flared, very deep with steep walls. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.8. **Collum:** Absent. **Crista superior:** Well developed along entire sulcus. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Oval and shallow in mid-area. **Ventral depression:** Absent. **Rostrum:** Moderate, broad and sharply rounded. **Antirostrum:** Short, broad and sharply rounded. **Excisura:** Moderately wide, notch deep, angle wide.

***Hologymnosus doliatus*, SSF No. 220.38 PLATE 116**

**DISTRIBUTION:** Central Pacific to east Africa, south to southern Natal. Attains at least 50 cm.

**MATERIAL:** 4/5 (3.0-4.8 mm OD, 203-350 mm TL), PEM 6436, 2879, 5963, 14533; Mauritius, Sodwana, Zululand and Natal; Id. MJS, PCH, GJBR.

**Otolith shape:** Obovate. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Raised and rounded; **sculpture,** slightly irregular. **Ventral margin:** Slightly rounded and crenate. **Posterior margin:** Sharply rounded, notched and irregular. **Sulcus acusticus:** Ostio-pseudocaudal to ostio-caudal, heterosulcoid. **Colliculum:** Heteromorph, very low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Moderately deep, may be very narrow along rostrum, dorsal wall undercuts dorsal area. **Cauda:** Flares ventrally, moderately deep. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.1, 1:1.4, 1:1, 1:1.1. **Collum:** Absent. **Crista superior:** Ridge-like over ostium and collum, well developed thereafter. **Crista inferior:** Well developed under neck and cauda, may be ridge under ostium. **Dorsal depression:** Elongate, narrow and shallow. **Ventral depression:** Absent, may be groove under ostium. **Rostrum:** Short, broad and sharply rounded. **Antirostrum:** Absent or small and rounded. **Excisura:** Moderately wide to wide, notch shallow, angle wide.

***Labroides dimidiatus*, SSF No. 220.41 PLATE 116**

**DISTRIBUTION:** Indo-Pacific; south to Algoa Bay. Attains 11.5 cm.

**MATERIAL:** 3/6 (1.3-1.65 mm OD, 46-77 mm TL), PEM 8447 (RUSI 28498), 11317, 2808; Sodwana, Kosi Bay; Id. MJS, PCH.

**Otolith shape:** Oval to ovate. **Thickness:** Moderately thick. **Form:** - Mesial slightly convex, - Lateral flat. **Dorsal margin:** Slightly rounded; **sculpture,** slightly irregular. **Ventral margin:** Slightly rounded and crenate. **Posterior margin:** Sharply rounded and approximately entire. **Sulcus acusticus:** Ostio-pseudocaudal, heterosulcoid. **Colliculum:** Heteromorph, colliculi depressed. **Pseudocolliculum:** Absent. **Ostium:** Short and flared. **Cauda:** Straight and slightly flared, moderately deep. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.5, 1:1.5, 1:1.2. **Collum:** Low. **Crista superior:** Well developed or low ridge from ostium to mid-cauda, poorly developed at caudal tip. **Crista inferior:** Well developed under neck, poorly developed at extremes. **Dorsal depression:** Oval and very shallow. **Ventral depression:** Absent, wide, shallow groove present near margin. **Rostrum:** Short, broad and sharply rounded. **Antirostrum:** Minute and rounded. **Excisura:** Moderately wide, notch shallow, angle wide.

***Pseudocheilinus hexataenia*, SSF No. 220.48 PLATE 116**

**DISTRIBUTION:** Indo-Pacific, south to Natal. Attains c. 10 cm.

**MATERIAL:** 2/2 (1.95, 2.9 mm OD, 58, 63 mm TL), PEM 15786, 14224 (RUSI 30587); Comoro Ids; Id. MJS, PCH, lodged in JLBSP.

**Otolith shape:** Obovate. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral flat. **Dorsal margin:** Raised; **sculpture,** slightly irregular. **Ventral margin:** Rounded and crenate. **Posterior margin:** Sharply rounded and slightly irregular. **Sulcus acusticus:** Ostio-pseudocaudal, heterosulcoid. **Colliculum:** Heteromorph, depressed colliculi. **Pseudocolliculum:** Absent. **Ostium:** Flared, moderately deep, dorsal wall steep. **Cauda:** Approximately straight, with flaring channel to posterior wall. **Ostio-caudal differentiation:** Very slightly dorso-ventrally constricted. **Ostium/cauda:** 1:1.6, 1:1.4. **Collum:** Very low and moderately elongate. **Crista superior:** Low ridge over neck, well developed elsewhere. **Crista inferior:** Well developed under entire sulcus. **Dorsal depression:** Elongate and oval. **Ventral depression:** Shallow crescent-shaped depression in mid-area. **Rostrum:** Short, broad and rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Moderate, notch moderately deep, angle wide.

***Pteragogus flagellifer*, SSF No. 220.52 PLATE 117**

**DISTRIBUTION:** Indian Ocean (occurrence in Pacific uncertain); south to Natal. Attains 20 cm.

**MATERIAL:** 1/1 (1.7 mm OD, 72 mm TL), PEM 15454 (RUSI 40571); Madagascar or Bazaruto Is.; Id. MJS, PCH.

**Otolith shape:** Approximately oblong. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral approximately flat. **Dorsal margin:** Rounded, tapering posteriorly; **sculpture,** lobed. **Ventral margin:** Slightly rounded and flattened posteriorly, sinuate to irregular. **Posterior margin:** Sharply rounded, tapered and lobed. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, slightly depressed colliculi. **Pseudocolliculum:** Absent. **Ostium:** Approximately oval, moderately deep, flared ventrally. **Cauda:** Approximately oval, straight, moderately deep and flared posteriorly. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:1.6. **Collum:** Low. **Crista superior:** Ridge-like from ostium to cauda, well developed near tip. **Crista inferior:** Well developed from ostium to cauda. **Dorsal**



**depression:** Moderately deep over neck and posterior ostium. **Ventral depression:** Broad, shallow and groove-like in mid-area. **Rostrum:** Small, broad and rounded. **Antirostrum:** Small and rounded. **Excisura:** Moderately wide, notch very shallow, angle wide.

*Pteragogus pelycus*, SSF No. 220.53 PLATE 117

**DISTRIBUTION:** Western Indian Ocean, south to Durban. Attains 15 cm.

**MATERIAL:** 1/1 (2.45 mm OD, 98 mm TL), PEM 15455 (RUSI 40572); Madagascar or Bazaruto Is.; Id. PCH.

**Otolith shape:** Approximately oblong. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral approximately flat. **Dorsal margin:** Rounded, tapering posteriorly; **sculpture**, slightly irregular. **Ventral margin:** Slightly rounded and flattened posteriorly, crenate. **Posterior margin:** Tapered and pointed to sharply rounded, and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, small, slightly raised colliculi. **Pseudocolliculum:** Absent. **Ostium:** Approximately oval, moderately deep. **Cauda:** Approximately oval, straight, moderately deep and slightly flared posteriorly. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:1.4. **Collum:** Absent. **Crista superior:** Ridge-like from ostium to cauda, well developed near tip. **Crista inferior:** Well developed or a low, broad ridge from ostium to cauda. **Dorsal depression:** Moderately deep over neck. **Ventral depression:** Broad, shallow and groove-like in mid-area. **Rostrum:** Small, broad and sharply rounded. **Antirostrum:** Small, narrow and pointed. **Excisura:** Moderate, notch shallow, angle acute.

*Stethojulis albovittata*, SSF No. 220.55 PLATE 117

**DISTRIBUTION:** Indian Ocean, from Red Sea to Natal. Attains 13 cm.

**MATERIAL:** 2/7 (1.7, 2.5 mm OD, 102, 113 mm TL), PEM 15428 & 15426 (both RUSI 40583), [15425, 15427 & 15429-15431 (all RUSI 40583)]; Bazaruto Is.; Id. MJS, PCH.

**Otolith shape:** Oblong to ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral flat. **Dorsal margin:** Slightly rounded; **sculpture**, crenate or irregular. **Ventral margin:** Slightly rounded and irregular. **Posterior margin:** Sharply rounded, may be notched and irregular. **Sulcus acusticus:** Ostio-pseudocaudal to ostio-caudal, heterosulcoid. **Colliculum:** Heteromorph, colliculi indented and indistinct. **Pseudocolliculum:** Absent. **Ostium:** Deep, flared anteriorly. **Cauda:** Flared posteriorly and moderately deep. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.2, 1:1.5. **Collum:** Absent or low. **Crista superior:** Well developed over ostium, ridge-like to cauda. **Crista inferior:** Broad ridge from ostium to cauda. **Dorsal depression:** Elongate and narrow. **Ventral depression:** Elongate and narrow, in mid-area. **Rostrum:** Moderately elongate, broad and blunt. **Antirostrum:** Broad, tapering and rounded or sharply rounded. **Excisura:** Moderately wide, notch moderately deep, angle acute.

*Stethojulis interrupta*, SSF No. 220.56 PLATE 117

**DISTRIBUTION:** Western Pacific to east Africa, south to Algoa Bay. Attains 13 cm.

**MATERIAL:** 5/21 (0.9-1.8 mm OD, 39-98 mm TL), PEM 10342, 10453, 10369, 10451, 10338; near Cape Recife, eastern Cape; Id. MJS.

**Otolith shape:** Approximately obovate. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral flat. **Dorsal margin:** Rounded and raised; **sculpture**, slightly irregular. **Ventral margin:** Slightly rounded or flat and slightly irregular. **Posterior margin:** Sharply rounded and slightly irregular. **Sulcus acusticus:** Ostio-pseudocaudal, heterosulcoid. **Colliculum:** Heteromorph, very low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Flared,

moderately deep. **Cauda:** Flared, moderately deep, poorly developed posterior wall. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:1, 1:1.3, 1:1.1, 1:1.1, 1:1.5. **Collum:** Low. **Crista superior:** Well developed over anterior ostium and posterior cauda, ridge-like over neck. **Crista inferior:** Well developed under entire sulcus. **Dorsal depression:** Oval and shallow. **Ventral depression:** Absent. **Rostrum:** Short, broad and rounded or pointed. **Antirostrum:** Small and sharply rounded. **Excisura:** Moderate, notch moderately deep, angle wide.

*Stethojulis strigiventer*, SSF No. 220.57 PLATE 117

**DISTRIBUTION:** Central Pacific to east Africa, south to Algoa Bay. Attains 15 cm.

**MATERIAL:** 1/1 (1.95 mm OD, 70 mm TL), PEM 4406; Ledsman Shoal; Id. PCH.

**Otolith shape:** Obovate. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral flat. **Dorsal margin:** Raised and rounded; **sculpture**, slightly irregular. **Ventral margin:** Flat and slightly irregular. **Posterior margin:** Sharply rounded to pointed, notched and irregular. **Sulcus acusticus:** Ostio-caudal, heterosulcoid. **Colliculum:** Heteromorph, indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Flared, moderately deep and narrow. **Cauda:** Flared ventrally, paddle-shaped and deep. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:1.4. **Collum:** Low. **Crista superior:** Well developed over ostium and posterior cauda, ridge-like over collum. **Crista inferior:** Well developed under collum, poorly developed at extremes. **Dorsal depression:** Oval and shallow. **Ventral depression:** Shallow, groove-like indentation in mid-area. **Rostrum:** Short, broad and rounded. **Antirostrum:** Moderate and broad, sharply rounded. **Excisura:** Moderately wide, notch deep, angle acute.

*Thalassoma amblycephalum*, SSF No. 220.58 PLATE 117

**DISTRIBUTION:** Indo-Pacific, south to Transkei coast. Attains 16 cm.

**MATERIAL:** 1/1 (1.5 mm OD, 62 mm TL), PEM 14246 (RUSI 30615); Comoro Ids; Id. PCH.

**Otolith shape:** Obovate. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Rounded; **sculpture**, entire. **Ventral margin:** Slightly rounded and crenate. **Posterior margin:** Sharply rounded and slightly irregular. **Sulcus acusticus:** Ostio-pseudocaudal, heterosulcoid. **Colliculum:** Heteromorph, colliculi depressed, indistinct. **Pseudocolliculum:** Absent. **Ostium:** Flared, shallow. **Cauda:** Straight dorsally, flared ventrally and moderately deep. **Ostio-caudal differentiation:** Slight ventral constriction. **Ostium/cauda:** 1:1.3. **Collum:** Narrow and low. **Crista superior:** Well developed over entire sulcus. **Crista inferior:** Well developed under collum, poorly developed at extremes. **Dorsal depression:** Shallow and elongate. **Ventral depression:** Absent. **Rostrum:** Short, broad and rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Moderate, notch shallow, angle wide.

*Thalassoma hebraicum*, SSF No. 220.61 PLATE 117

**DISTRIBUTION:** Indian Ocean south to Algoa Bay. Attains at least 23 cm.

**MATERIAL:** 5/10 (2.35-4.3 mm OD, 102-197 mm FL), PEM 4402, 5992, 8156 (RUSI 34142), 8213 (RUSI 34153), 5664, [8309 (RUSI 37426)]; Zululand, Kosi Bay and Ledsman Shoal; Id. MJS, PCH.

**Otolith shape:** Oval to ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral slightly concave. **Dorsal margin:** Rounded and raised, may be emarginate; **sculpture**, slightly



irregular. **Ventral margin:** Slightly rounded and serrate. **Posterior margin:** Sharply rounded, notched and slightly irregular. **Sulcus acusticus:** Ostio-pseudocaudal or ostio-caudal, heterosulcoid. **Colliculum:** Heteromorph, colliculi indistinct. **Pseudocolliculum:** Absent. **Ostium:** Flared, deep, walls steep. **Cauda:** Straight, flared ventrally and bulbous, deep. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:1.7, 1:1.1, 1:1.4, 1:1.3, 1:1.8. **Collum:** Very low. **Crista superior:** Well developed over entire sulcus, may be ridge-like over neck. **Crista inferior:** Well developed under sulcus, poorly developed at caudal tip. **Dorsal depression:** Oval and shallow. **Ventral depression:** Absent. **Rostrum:** Short, broad and rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Moderate or moderately wide, notch shallow, angle varies.

***Thalassoma lunare*, SSF No. 220.62 PLATE 117**

**DISTRIBUTION:** Indo-Pacific, south to Algoa Bay. Attains 25 cm.

**MATERIAL:** 2/5 (2.55, 3.4 mm OD, 207 mm TL, 0011 not measured), PEM 0011, 8291 (RUSI 34149), [14769 (RUSI 31408), 15477 (RUSI 40592)]; Kosi Bay and PEO; Id. PCH, GJBR.

**Otolith shape:** Approximately obovate. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Slightly raised; sculpture, slightly irregular. **Ventral margin:** Slightly rounded and crenate. **Posterior margin:** Sharply rounded, may be notched and irregular. **Sulcus acusticus:** Ostio-pseudocaudal (2.5 mm OD) becoming ostio-caudal, heterosulcoid. **Colliculum:** Heteromorph, indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Very deep and flared. **Cauda:** Flared, moderately deep. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.4, 1:1.1. **Collum:** Low, narrow. **Crista superior:** Well developed over sulcus, may be ridge-like over neck. **Crista inferior:** Well developed or ridge-like under collum, well developed at extremes. **Dorsal depression:** Oval and shallow. **Ventral depression:** Absent. **Rostrum:** Short, broad and rounded or blunt. **Antirostrum:** Small and pointed. **Excisura:** Moderately wide, notch moderately deep, angle wide.

***Thalassoma purpureum*, SSF No. 220.63 PLATE 118**

**DISTRIBUTION:** Indo-Pacific; south to Algoa Bay. Attains 43 cm.

**MATERIAL:** 4/6 (1.8-4.2 mm OD, 115-357 mm TL), PEM 0448, 8668 (RUSI 37456), 9603, 8811; Kosi Bay and ORI; Id. MJS, PCH.

**Otolith shape:** Obovate to oval (c. 2.5 mm OD) becoming anvil-shaped (c. 3.7 mm OD). **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Rounded and raised; sculpture, slightly irregular. **Ventral margin:** Slightly rounded and crenate or irregular. **Posterior margin:** Sharply rounded becomes notched and irregular. **Sulcus acusticus:** Ostio-pseudocaudal (<2.5 mm OD) becoming ostio-caudal (c. 3.7 mm OD), heterosulcoid. **Colliculum:** Heteromorph, colliculi low. **Pseudocolliculum:** Absent. **Ostium:** Slightly flared, dorsal walls steep. **Cauda:** Flared, deep, posterior margin erodes in large specimens (c. 3.5 mm OD). **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:1.2, 1:1.3, 1:1, 1:1.1. **Collum:** Low. **Crista superior:** Well developed over ostium and posterior cauda, may be ridge-like over neck. **Crista inferior:** Well developed under collum, poorly developed at extremes. **Dorsal depression:** Oval and shallow. **Ventral depression:** Absent. **Rostrum:** Short, broad and sharply rounded. **Antirostrum:** Short, broad and pointed. **Excisura:** Moderate to moderately wide, notch moderately deep, angle wide.

***Thalassoma trilobatum*, SSF No. 220.65 PLATE 118**

**DISTRIBUTION:** Indo-Pacific, south to Transkei. Attains 30 cm. **MATERIAL:** 1/1 (2.6 mm OD, 165 mm TL), PEM 0446; ORI; Id. GJBR.

**Otolith shape:** Approximately obovate. **Thickness:** Moderate. **Form:** - Mesial very slightly convex, - Lateral flat. **Dorsal margin:** Slightly rounded; sculpture, slightly irregular. **Ventral margin:** Slightly rounded, slightly irregular. **Posterior margin:** Sharply rounded and notched, slightly irregular. **Sulcus acusticus:** Ostio-pseudocaudal, heterosulcoid. **Colliculum:** Heteromorph, both colliculi very low. **Pseudocolliculum:** Absent. **Ostium:** Flared, deep dorsally. **Cauda:** Flared, deep anteriorly. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:1.1. **Collum:** Narrow and moderately high. **Crista superior:** Well developed over ostium and posterior cauda, ridge-like over neck. **Crista inferior:** Well developed under collum, moderately well developed at extremes. **Dorsal depression:** Oval and shallow. **Ventral depression:** Absent. **Rostrum:** Short, broad and rounded. **Antirostrum:** Short, narrow and sharply rounded. **Excisura:** Moderately wide, notch moderately deep, angle acute.

***Xyrichtys pavo*, SSF No. 220.67 PLATE 118**

**DISTRIBUTION:** Indo-Pacific, from northern Red Sea to Natal. Attains c. 35 cm.

**MATERIAL:** 4/4 (2.3-3.7 mm OD, 101-173 mm TL), PEM 6477, 6478, 6476, 6475; off Durban; Id. MJS.

**Otolith shape:** Discoid. **Thickness:** Moderately thick. **Form:** - Mesial slightly convex, - Lateral flat. **Dorsal margin:** Well rounded; sculpture, irregular. **Ventral margin:** Well rounded, crenate or irregular. **Posterior margin:** Rounded and lobed or crenate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, fused and depressed in centre. **Pseudocolliculum:** Absent. **Ostium:** Narrow, elongate, slightly flared and deep. **Cauda:** Short and rounded. **Ostio-caudal differentiation:** Very slightly dorso-ventrally constricted. **Ostium/cauda:** 1:0.6, 1:0.5, 1:0.7, 1:0.9. **Collum:** Absent. **Crista superior:** Well developed over ostium becoming low ridge over neck, well developed over cauda. **Crista inferior:** Well developed under entire sulcus. **Dorsal depression:** Very shallow, if present. **Ventral depression:** Absent. **Rostrum:** Very short, broad and rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Narrow, notch moderately shallow, angle wide.

**SCARIDAE Nelson No. 360**

**Family characteristics:** Ten species described but no key provided because otoliths very similar and exhibit ontogenetic variation. Otoliths generally oval to oblong, up to at least 7.5 mm OD. Homosulcoid with ostio-caudal openings. Ostium usually slightly broader than cauda, usually separated by a low collum. Usually homomorph with either low colliculi or their margins may be raised. Crista superior ridge-like over neck, usually well developed elsewhere but may be poorly developed at extremes. Otoliths somewhat similar to the Labridae.

***Calotomus spinidens*, SSF No. 221.2 PLATE 118**

**DISTRIBUTION:** Western Pacific to east Africa, south to Delagoa Bay. Attains 19 cm.

**MATERIAL:** 4/4 (2.8-3.3 mm OD, 123-124 mm TL), PEM 15412 & 15436 (both RUSI 40578), 2774, 15411 (RUSI 40579); Baz-aruto Is. and Sodwana; Id. MJS, PCH.

**Otolith shape:** Approximately oval. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Rounded; sculpture, slightly irregular. **Ventral margin:** Rounded and serrate or dentate to irregular. **Posterior margin:**



Rounded, indented and irregular. **Sulcus acusticus:** Ostio-caudal, homosulcoid. **Colliculum:** Homomorph, extremely low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Flares, anterior walls poorly defined, posteriorly walls steep. **Cauda:** Flares, same depth as ostium, walls poorly defined posteriorly. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.1, 1:1.1, 1:1.3, 1:1.1. **Collum:** Low. **Crista superior:** Ridge-like in neck, either moderately well or poorly developed at extremes. **Crista inferior:** Well developed at neck, poorly developed elsewhere. **Dorsal depression:** Oval and moderately deep. **Ventral depression:** Absent. **Rostrum:** Short, broad and rounded or irregular. **Antirostrum:** Small and sharply rounded. **Excisura:** Moderate, notch very shallow, angle wide.

#### *Leptoscarus vaigiensis*, SSF No. 221.3 PLATE 118

**DISTRIBUTION:** Easter Is. to east Africa, south to the Transkei. Attains at least 35 cm.

**MATERIAL:** 2/4 (2.85, 3.45 mm OD, 109, 169 mm TL), PEM 15442 (RUSI 40560), 15423 (RUSI 40582); Madagascar or Bazaruto Is.; Id. PCH, MJS.

**Otolith shape:** Oval to oblong. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Rounded, slightly raised; **sculpture**, slightly irregular. **Ventral margin:** Slightly rounded, slightly serrate or irregular. **Posterior margin:** Tapering, sharply rounded to pointed and irregular. **Sulcus acusticus:** Ostio-caudal, homosulcoid. **Colliculum:** Homomorph, posterior colliculum low and slightly narrower than low anterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Flared, moderately deep. **Cauda:** Flared, moderately deep, narrower than ostium. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.3, 1:1. **Collum:** Very low. **Crista superior:** Well developed at extremes, ridge-like from ostium to mid-cauda. **Crista inferior:** Well developed along entire sulcus, but may be poor at extremes. **Dorsal depression:** Oval and deep above crista. **Ventral depression:** Either absent or shallow depression below neck. **Rostrum:** Moderately elongate, pointed or sharply rounded. **Antirostrum:** Small and pointed. **Excisura:** Moderate, notch shallow, angle varies.

#### *Hipposcarus harid*, SSF No. 221.5 PLATE 118

**DISTRIBUTION:** Indian Ocean and Red Sea; south on east African coast to Bazaruto. Attains c. 75 cm.

**MATERIAL:** 2/2 (6.08, 7.08 mm OD, 325, 424 mm TL), 1052H, PEM 15383 (RUSI 40599); Madagascar and Red Sea; Id. PCH, TH.

**Otolith shape:** Approximately oval becoming oblong. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral flat. **Dorsal margin:** Well rounded becoming flattened; **sculpture**, dentate or irregular. **Ventral margin:** Rounded or slightly rounded and crenate to dentate. **Posterior margin:** Pointed or rounded and irregular. **Sulcus acusticus:** Ostio-caudal, homosulcoid. **Colliculum:** Homomorph, both slightly raised. **Pseudocolliculum:** Absent. **Ostium:** Flared dorsally, walls steep. **Cauda:** Flared, ventral walls steep. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.6, 1:1.3. **Collum:** Low and rounded. **Crista superior:** Ridge-like in neck, poorly developed elsewhere. **Crista inferior:** Well developed under entire sulcus. **Dorsal depression:** Deep and approximately oval. **Ventral depression:** Absent, may have very narrow groove. **Rostrum:** Large, blunt or rounded. **Antirostrum:** Small and pointed. **Excisura:** Moderate, notch very shallow, angle acute.

#### *Scarus cyanescens*, SSF No. 221.8 PLATE 118

**DISTRIBUTION:** Rare, known only from Mauritius, Madagascar, Zanzibar and Natal to 30°S. Attains 50 cm.

**MATERIAL:** 2/2 (6.2, 7.0 mm OD, 312, 364 mm TL), PEM 15405 & 15404 (both RUSI 40603); Madagascar; Id. MJS, PCH.

**Otolith shape:** Oval to approximately oblong. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded to flat; **sculpture**, irregular. **Ventral margin:** Slightly rounded or flat and irregular. **Posterior margin:** Tapered, pointed, may be notched and irregular. **Sulcus acusticus:** Ostio-caudal, homosulcoid. **Colliculum:** Homomorph, colliculi indented with raised margins. **Pseudocolliculum:** Absent. **Ostium:** Flared, mainly dorsally, moderately deep. **Cauda:** Flared, moderately deep. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.1, 1:1.2. **Collum:** Absent or very low. **Crista superior:** Poor or well developed at extremes, ridge-like from ostium to mid-cauda. **Crista inferior:** Poor at extremes, otherwise well developed. **Dorsal depression:** Crescentic above the crista. **Ventral depression:** Absent, area may be slightly reticulate in upper third. **Rostrum:** Short, broad, rounded or blunt. **Antirostrum:** Very small, sharply rounded or absent. **Excisura:** Moderate, notch very shallow if present, angle wide.

#### *Scarus ghobban*, SSF No. 221.11 PLATE 119

**DISTRIBUTION:** Wide ranging, occurring from the eastern Pacific to the Red Sea and south to Algoa Bay. Attains 74 cm.

**MATERIAL:** 3/3 (3.5-5.2 mm OD, 210-c. 430 mm TL), PEM 15741 & 15740 (both RUSI 42706), 5922; Red Sea and ORI; Id. RvdE, PCH.

**Otolith shape:** Approximately oval. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Rounded; **sculpture**, irregular or crenate. **Ventral margin:** Rounded or slightly rounded and lobed or irregular. **Posterior margin:** Rounded or pointed, notched and irregular. **Sulcus acusticus:** Ostio-caudal, homosulcoid. **Colliculum:** Homomorph, low, nodular colliculi. **Pseudocolliculum:** Absent. **Ostium:** Flared, oval. **Cauda:** Flared and moderately deep. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.3, 1:1.3, 1:1.2. **Collum:** Low. **Crista superior:** Ridge-like from mid-ostium to mid-cauda, moderately well developed at extremes. **Crista inferior:** Well developed under entire sulcus. **Dorsal depression:** Oval, elongate and deep. **Ventral depression:** Absent. **Rostrum:** Short, broad and rounded, may be notched. **Antirostrum:** Minute or small and sharply rounded. **Excisura:** Moderate, notch shallow, angle wide.

#### *Scarus niger*, SSF No. 221.13 PLATE 119

**DISTRIBUTION:** Indo-Pacific, south to Sodwana Bay. Attains 40 cm.

**MATERIAL:** 2/2 (3.35, 7.36 mm OD, 157, 286 mm TL), 1019H, PEM 15382 (RUSI 40605); Madagascar and Eilat, Red Sea; Id. PCH, DF.

**Otolith shape:** Oval. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Rounded; **sculpture**, slightly irregular. **Ventral margin:** Rounded becoming flat and crenate or irregular. **Posterior margin:** Rounded becoming pointed (c. 7 mm OD) and slightly irregular. **Sulcus acusticus:** Ostio-caudal, approximately homosulcoid. **Colliculum:** Homomorph, colliculi becoming more distinct with growth. **Pseudocolliculum:** Absent. **Ostium:** Flares, walls steep in posterior. **Cauda:** Flares widely, opens to postero-dorsal margin, shallow posteriorly. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.4, 1:1.3. **Collum:** Low. **Crista superior:** Ridge-like from mid-ostium to mid-cauda, very poorly developed at extremes, becoming well developed with growth. **Crista inferior:** Well developed below neck, poor at anterior ostium and caudal tip, becomes well developed under entire sulcus with growth. **Dorsal depression:** Oval to elongate. **Ventral depression:** Absent, may be short groove under neck. **Rostrum:** Broad



and blunt becoming moderate, narrower and blunt. **Antirostrum:** Small and pointed. **Excisura:** Moderate, notch shallow, angle acute.

#### *Scarus psittacus*, SSF No. 221.14 PLATE 119

**DISTRIBUTION:** Red Sea and Indo-Pacific, south to Sodwana. Attains c. 24 cm.

**MATERIAL:** 2/2 (4.6, 5.68 mm OD, 190, 255 mm TL), PEM 14558 (RUSI 31450), 15398 (RUSI 40590); Madagascar and Mauritius; Id. MJS, PCH.

**Otolith shape:** Approximately oval. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Rounded; **sculpture,** slightly lobed and slightly irregular. **Ventral margin:** Rounded, dentate and irregular to digitate. **Posterior margin:** Tapering, pointed and irregular. **Sulcus acusticus:** Ostio-caudal, approximately homosulcoid. **Colliculum:** Homomorph, low, approximately oval colliculi. **Pseudocolliculum:** Absent. **Ostium:** Slightly flared, deep and oval, dorsal wall steep. **Cauda:** Slightly flared. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.2, 1:1.3. **Collum:** Low. **Crista superior:** Ridge-like from mid-ostium to mid-cauda, well developed at extremes. **Crista inferior:** Well developed along sulcus, may be poor under anterior ostium. **Dorsal depression:** Oval and deep. **Ventral depression:** Absent, margin slopes sharply. **Rostrum:** Broad and blunt. **Antirostrum:** Minute or small and pointed. **Excisura:** Moderate, notch shallow or very shallow, angle wide.

#### *Scarus rubroviolaceus*, SSF No. 221.15 PLATE 119

**DISTRIBUTION:** Eastern Pacific to Durban. Attains 66 cm.

**MATERIAL:** 1/1 (5.94 mm OD, 473 mm TL), PEM 15485 (RUSI 40618); Sodwana Bay; Id. MJS, SAC, PCH.

**Otolith shape:** Approximately elliptic. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Lateral surface:** Radiating ridges from nucleus. **Dorsal margin:** Slightly rounded; **sculpture,** irregular. **Ventral margin:** Slightly rounded and irregular. **Posterior margin:** Tapered, pointed and irregular. **Sulcus acusticus:** Ostio-caudal, homosulcoid. **Colliculum:** Approximately heteromorph, posterior colliculum narrower than anterior. **Pseudocolliculum:** Absent. **Ostium:** Flares widely, approximately oval, moderately deep. **Cauda:** Approximately oblong, moderately deep. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.2. **Collum:** Absent. **Crista superior:** Well developed at extremes, ridge-like from mid-ostium to cauda. **Crista inferior:** Well developed along its length. **Dorsal depression:** Oblong, moderately deep. **Ventral depression:** Pit-like under neck, may have groove in mid-area between ostium and cauda. **Rostrum:** Short, moderately broad and rounded. **Antirostrum:** Short and pointed. **Excisura:** Moderate, notch shallow, angle wide.

#### *Scarus scaber*, SSF No. 221.17 PLATE 119

**DISTRIBUTION:** Islands of western Indian Ocean and coast of East Africa, south to Natal. Attains 37 cm.

**MATERIAL:** 1/1 (5.3 mm OD, 235 mm TL), PEM 14559 (RUSI 31430); Mauritius; Id. MJS, PCH.

**Otolith shape:** Approximately oval. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Rounded; **sculpture,** lobed or irregular. **Ventral margin:** Rounded, serrate, crenate or irregular. **Posterior margin:** Tapered, pointed and irregular. **Sulcus acusticus:** Ostio-caudal, homosulcoid. **Colliculum:** Homomorph, colliculi low. **Pseudocolliculum:** Absent. **Ostium:** Flared, steep walls posteriorly. **Cauda:** Flared, deepens anteriorly. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.1. **Collum:** Very low. **Crista superior:** Well developed over ostium, ridge-

like from mid-ostium to mid-cauda, poorly developed at posterior cauda. **Crista inferior:** Well developed at neck, poor at extremes. **Dorsal depression:** Oval and deep. **Ventral depression:** Absent. **Rostrum:** Large, broad and bluntly rounded. **Antirostrum:** Small and pointed. **Excisura:** Moderate, notch shallow, angle acute.

#### *Scarus sordidus*, SSF No. 221.18 PLATE 119

**DISTRIBUTION:** Indo-Pacific, south to Natal. Attains 40 cm.

**MATERIAL:** 1/1 (5.64 mm OD, 275 mm TL), 0985H; Dahab, Sinai; Id. AB, TH.

**Otolith shape:** Approximately oval. **Thickness:** Moderately thick. **Form:** - Mesial very convex, - Lateral slightly concave. **Dorsal margin:** Rounded and raised; **sculpture,** irregular. **Ventral margin:** Rounded, crenate and irregular. **Posterior margin:** Sharply rounded, notched and irregular. **Sulcus acusticus:** Ostio-caudal, homosulcoid. **Colliculum:** Homomorph, indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Flared, moderately deep, walls steep. **Cauda:** Flared and moderately deep. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.3. **Collum:** Low. **Crista superior:** Ridge-like at neck, well developed at extremes. **Crista inferior:** Very well developed at neck, moderately well developed at extremes. **Dorsal depression:** Oval and moderately deep. **Ventral depression:** Absent. **Rostrum:** Broad and bluntly rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Moderate, notch shallow, angle acute.

### ZOARCIDAE Nelson No. 362

**Family characteristics:** Otoliths small (<c.6 mm OD), heterosulcoid, ostial with distinct oval to fan-shaped dorsal depression, usually striated. Colliculi vary in form and development. Rostrum small and rounded.

#### Key

- 1a. Otolith oval; cauda pit-like; collum distinct separating ostium and cauda . . . *Melanostigma gelatinosum* 94.3
- 1b. Otolith rounded triangular or off-oval; ostium and cauda not separated by collum . . . . . 2
- 2a. Ostium partly closed anteriorly giving sulcus a mesial opening appearance; ventral groove distinct and wide from rostrum to posterior of otolith . . . . .  
. . . . . *Pachycara crassiceps* 94.-
- 2b. Ostium elongate giving sulcus groove-like appearance; ventral groove short on rostrum. . . . .  
. . . . . *Lycodes agulhensis* 94.1

#### *Lycodes agulhensis*, SSF No. 94.1 PLATE 119

**DISTRIBUTION:** Known from Cap Blanc, Mauritania, to Agulhas Bank. Attains 45 cm.

**MATERIAL:** 4/10 (5.2-6.0 mm OD, 236-287 mm TL), PEM 14511 (RUSI 31401), 13966 (SAM 31620), 14512 (RUSI 31400), 14459 (RUSI 31460); Cape west coast; Id. MJS, MEA.

**Otolith shape:** Rounded-triangular to off-oval. **Thickness:** Thick. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Well rounded; **sculpture,** crenate or lobed. **Ventral margin:** Slightly rounded and irregular. **Posterior margin:** Slightly rounded to flat and lobed. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, very low and poorly defined. **Pseudocolliculum:** Absent. **Ostium:** Long and narrow with narrow colliculum, may join a ventral groove under rostrum in some otoliths. **Cauda:** Oval, widening slightly. **Ostio-caudal differentiation:** Slight ventral constriction. **Ostium/cauda:** 1:0.6, 1:0.6, 1:0.8, 1:0.4. **Collum:** Absent. **Crista superior:** Well developed, slightly rounded ridge over ostium. **Crista inferior:** Poorly developed. **Dorsal depression:** Fan-shaped and flat with radiating striations. **Ventral depression:** Absent, short ventral groove along margin



from rostrum but may be absent. **Rostrum:** Small, rounded. **Antirostrum:** Minute and rounded. **Excisura:** Narrow, notch shallow, angle variable.

***Melanostigma gelatinosum*, SSF No. 94.3 PLATE 120**

**DISTRIBUTION:** Off Cape Town, New Zealand, tip of South America and in the Scotia Sea. Probably throughout subantarctic islands. Attains 23cm.

**MATERIAL:** 1/1 (1.0 mm OD, 122 mm TL), PEM 13345; Cape west coast; lodged in SAM.

**Otolith shape:** Circular. **Thickness:** Thick. **Form:** - Mesial flat, - Lateral flat. **Dorsal margin:** Rounded; **sculpture**, entire. **Ventral margin:** Rounded and entire. **Posterior margin:** Rounded and entire. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Indistinct colliculum visible in ostium only. **Pseudocolliculum:** Absent. **Ostium:** Short, wide, deep and semi-circular pit-like. **Cauda:** Elongate and deep. **Ostio-caudal differentiation:** Slight dorso-ventral constrictions. **Ostium/cauda:** 1:2.2. **Collum:** Wall-like and steep, confluent with mesial surface. **Crista superior:** Well developed over cauda, well developed over ostium. **Crista inferior:** Well developed. **Dorsal depression:** Oval to fan-shaped, striated and flat. **Ventral depression:** Absent. **Rostrum:** Short, blunt and rounded. **Antirostrum:** Absent. **Excisura:** Moderate, notch absent.

***Pachycara crassiceps* (Roule, 1916), SSF No. 94.—  
PLATE 120**

**DISTRIBUTION:** In eastern Atlantic from southwest of Ireland to off South Africa (Anderson 1989). Attains at least 52 cm.

**MATERIAL:** 2/2 (3.6, 3.9 mm OD, 376, 412 mm TL), PEM 14613 (SAM 32191), 13784 (SAM 31618); Cape west coast; Id. MEA.

**Otolith shape:** Rounded-triangular. **Thickness:** Moderately thick. **Form:** - Mesial approximately flat, - Lateral convex. **Dorsal margin:** Domed; **sculpture**, entire. **Ventral margin:** Slightly rounded and entire. **Posterior margin:** Sharply rounded and entire. **Sulcus acusticus:** Para-ostial, appears mesial if not coated, heterosulcoid. **Colliculum:** No raised colliculi. **Pseudocolliculum:** Absent. **Ostium:** Small, poorly defined, shallower than cauda, mouth partially closed by anterior wall. **Cauda:** Oval, depressed, deeper than ostium. **Ostio-caudal differentiation:** Very slight dorso-ventral constriction. **Ostium/cauda:** 1:0.9, 1:0.9. **Collum:** Absent. **Crista superior:** Well developed, uneven with gap in mid-cauda. **Crista inferior:** Well developed, ridge-like under anterior ostium. **Dorsal depression:** Triangular, flat and grooved. **Ventral depression:** Absent, distinct, wide and deep ventral groove. **Rostrum:** Short, broad and rounded. **Antirostrum:** Short and rounded. **Excisura:** Narrow, notch shallow, angle wide.

**OPISTOGNATHIDAE Nelson No. 375**

**Family characteristics:** One species described. Otoliths oblong up to at least 8 mm OD. Heterosulcoid with ostial opening, cauda narrow, anterior cauda upwardly flexed then curved down along its length. Heteromorph with low anterior and indistinct posterior colliculum.

***Opistognathus muscatensis*, SSF No. 225.2 PLATE 120**

**DISTRIBUTION:** Known from Durban to Gulf of Arabia, also Seychelles. Attains 41 cm.

**MATERIAL:** 3/3 (7.1-8.2 mm OD, 330-370 mm TL), PEM 5666, 2082, 8593; Durban, Zululand and Sodwana; Id. RvdE, MJS. **NOTE:** Otolith variation suggests that more than one species may be represented here.

**Otolith shape:** Oblong. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral approximately flat. **Lateral surface:** Low ridge along otolith length, narrowing towards margins. **Dorsal margin:**

Rounded; **sculpture**, irregular or crenate. **Ventral margin:** Slightly rounded or flattened, crenate or irregular. **Posterior margin:** Rounded may be notched and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior colliculum slightly raised, posterior indistinct. **Pseudocolliculum:** Absent. **Ostium:** Flares dorsally, moderately deep, anterior dorsal wall poorly defined. **Cauda:** Flexed upward and curved along its length, narrow and deep. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1, 1:0.9, 1:0.9. **Collum:** Absent. **Crista superior:** Ridge-like from mid-ostium to mid-cauda, very poorly developed above ostium, well developed over posterior cauda. **Crista inferior:** Low ridge below ostium, well developed below cauda. **Dorsal depression:** Oval. **Ventral depression:** Elongate depression under cauda and margin depressed. **Rostrum:** Moderate, broad and pointed. **Antirostrum:** Absent or small and sharply rounded. **Excisura:** Moderate, notch (if present), shallow and angle wide.

**CONGROGADIDAE Nelson No. 376**

**Family characteristics:** One species described. Otoliths fusiform and small, up to c. 1.9 mm OD. Heterosulcoid with ostial opening. Cauda shallow and narrow, slightly flexed along its length. Heteromorph, colliculi low or indistinct. Rostrum elongate and pointed.

***Halidesmus scapularis*, SSF No. 227.1 PLATE 120**

**DISTRIBUTION:** False Bay to Coffee Bay, Transkei. Attains 20 cm.

**MATERIAL:** 7/95 (1.5-1.85 mm OD, 93-157 mm TL), PEM 10277, 3141, 10386, 4044, 5227, 9865, 5231; Algoa Bay and environs; Id. MJS, PCH.

**Otolith shape:** Fusiform. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral convex. **Dorsal margin:** Slightly rounded; **sculpture**, entire. **Ventral margin:** Slightly rounded and entire. **Posterior margin:** Pointed and entire. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, slightly raised anterior colliculum, posterior very indistinct. **Pseudocolliculum:** Absent. **Ostium:** Short, flared dorsally, lies mainly on rostrum, may be very narrow. **Cauda:** Shallow, very gently flexed. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.1, 1:1.1, 1:1.4, 1:1.3, 1:1.4, 1:1.2, 1:1.2. **Collum:** Absent, slight step up to cauda. **Crista superior:** Poor to well developed above ostium with low ridge along cauda, poor at tip. **Crista inferior:** Moderately well developed along entire sulcus. **Dorsal depression:** Very shallow above anterior cauda. **Ventral depression:** Absent, groove in mid-area. **Rostrum:** Large and pointed. **Antirostrum:** Absent or minute and rounded. **Excisura:** Wide, notch (if present) very shallow, angle wide.

**CHIASMODONTIDAE Nelson No. 377**

**Family characteristics:** One species described. Otolith approximately ovate, to at least 5 mm OD. Heterosulcoid, mesial opening. Ostium and cauda of similar width, curved along length of sulcus. Heteromorph, colliculi low, posterior smaller and narrower than anterior.

***Kali macrodon*, SSF No. 228.6 PLATE 120**

**DISTRIBUTION:** Tropical/subtropical in all three major oceans, known from a few scattered localities from gulf of Mexico to Ecuador. Within this area, holotype from off Cape Town.

**MATERIAL:** 1/1 (5.2 mm OD, 170 mm TL), PEM 13612; Cape west coast, lodged in SAM.

**Otolith shape:** Approximately ovate. **Thickness:** Moderately thin. **Form:** - Mesial flat, - Lateral flat. **Dorsal margin:** Flat; **sculpture**, slightly irregular. **Ventral margin:** Slightly rounded and lobed or irregular. **Posterior margin:** Rounded to blunt and



lobed. **Sulcus acusticus:** Mesial, heterosulcoid. **Colliculum:** Heteromorph, very low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Curves dorsally, flat and shallow with oval colliculum. **Cauda:** Curves dorsally with parallel walls, posterior edge poorly defined, as broad as ostium. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:0.8. **Collum:** Absent. **Crista superior:** Ridge-like from mid-ostium and along cauda, absent above anterior ostium and caudal tip. **Crista inferior:** Very poorly developed in mid area, absent elsewhere. **Dorsal depression:** Oval, very shallow, covers most of area. **Ventral depression:** Absent. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

#### CHAMPSODONTIDAE Nelson No. 378

**Family characteristics:** One species described. Otoliths oval up to c. 3.3 mm OD. Archaesulcoid with mesial opening, sulcus elongate slit-like. Homomorph with single colliculum, may be indented.

##### *Champsodon capensis*, SSF No. 229.1 PLATE 120

**DISTRIBUTION:** A widely distributed species reported from India, Indonesia and the Philippines; from the Cape to Durban. Attains 14 cm.

**MATERIAL:** 5/94 (1.5-3.3 mm OD, 57-146 mm TL), PEM 7164, 12568 (RUSI 28461), 12464, 13030, 11300, [12853 (RUSI 34061), 12573 (RUSI 28461), 12769 (RUSI 28511)]; Mozambique and Agulhas Bank; Id. MJS, PCH.

**Otolith shape:** Approximately oval. **Thickness:** Moderately thin. **Form:** - Mesial flat, - Lateral flat. **Dorsal margin:** Rounded; sculpture, lobed and irregular. **Ventral margin:** Rounded and irregular. **Posterior margin:** Sharply rounded or pointed and slightly irregular. **Sulcus acusticus:** Mesial, archaesulcoid. **Colliculum:** Homomorph with single colliculum, pointed, indented in anterior and irregular. **Pseudocolliculum:** Absent. **Ostium and cauda:** Undifferentiated, sulcus slit-like, elongate and narrow, widest at centre. **Ostio-caudal differentiation:** Absent. **Collum:** Absent. **Crista superior:** May be a short rounded ridge in centre, absent elsewhere. **Crista inferior:** May be a short rounded ridge in centre, absent elsewhere. **Dorsal depression:** Shallow and wide, covers most of dorsal area. **Ventral depression:** Most of ventral area depressed. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

#### URANOSCOPIDAE Nelson No. 383

**Family characteristics:** One species described. Otoliths oval, up to c. 12 mm OD. Archaesulcoid with mesial opening, sulcus broad and slit-like. Homomorph, colliculum very indistinct.

##### *Uranoscopus archionema*, SSF No. 230.2 PLATE 120

**DISTRIBUTION:** From Mossel Bay to Kenya; common in Mozambique Channel. Attains 33 cm.

**MATERIAL:** 5/18 (8.0-11.8 mm OD, 171-300 mm TL), PEM 12911, 12910 (RUSI 28460), 12930, 12970, 12909; off Mozambique; Id. MJS, PCH.

**Otolith shape:** Oval. **Thickness:** Thick. **Form:** - Mesial convex, - Lateral convex. **Dorsal margin:** Rounded; sculpture, slightly irregular or entire. **Ventral margin:** Rounded and entire. **Posterior margin:** Sharply rounded and entire. **Sulcus acusticus:** Mesial, archaesulcoid. **Colliculum:** Homomorph, indistinct single colliculum. **Pseudocolliculum:** Absent. **Ostium and cauda:** Undifferentiated but sulcus slit-like and curved, may be very shallow. **Ostio-caudal differentiation:** Absent. **Ostium/cauda:** Absent. **Collum:** Absent. **Crista superior:** Well developed becoming low ridge along sulcus in larger otoliths (>10 mm OD). **Crista inferior:** Well developed becoming low ridge along entire sulcus in larger otoliths. **Dorsal depression:** Area depressed and

rugose. **Ventral depression:** Narrow below crista and there may be groove near margin and anterior tip may be depressed. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

#### PERCOPHIDAE Nelson No. 387

**Family characteristics:** Two species described. Otoliths similar to Callionymidae. Otoliths approximately ovate with rounded and lobed dorsal margin, up to c. 6.1 mm OD. Heterosulcoid with ostial opening. Ostium elongate, narrow and indented, cauda short, filled with colliculum and approximately straight with rounded tip. Heteromorph, anterior colliculum indented, posterior fills cauda.

##### Key

- 1a. Rostrum broad with bluntly rounded tip; antirostrum minute; cauda straight, length moderate; caudal tip swollen and rounded . . . *Bembrops platyrhynchus* 233.1
- 1b. Rostrum tapered, and sharply rounded to pointed; antirostrum broad and sharply rounded; cauda very short and rounded . . . . . *Bembrops* sp. 233.-

##### *Bembrops platyrhynchus*, SSF No. 233.1 PLATE 121

**DISTRIBUTION:** Off Natal and northern Indian Ocean. Attains 25 cm.

**MATERIAL:** 1/1 (6.1 mm OD, 185 mm TL), PEM 13050 (RUSI 28459); Mozambique; Id. MJS, PCH.

**Otolith shape:** Approximately ovate. **Thickness:** Moderately thick. **Form:** - Mesial flat, - Lateral flat. **Dorsal margin:** Rounded; sculpture, lobed. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Sharply rounded and lobed. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, posterior colliculum fills cauda, anterior is indented and low. **Pseudocolliculum:** Absent. **Ostium:** Narrow and elongate with parallel walls and upturned rostral tip. **Cauda:** Short, straight with slightly swollen tip. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:0.6. **Collum:** Absent, step up to cauda. **Crista superior:** Well developed above ostium, ridge-like from neck along cauda. **Crista inferior:** Well developed below ostium, moderately well developed below cauda. **Dorsal depression:** Deep and oval above cauda. **Ventral depression:** Absent, groove along ventral margin. **Rostrum:** Short, broad and bluntly rounded. **Antirostrum:** Minute and sharply rounded. **Excisura:** Moderate, notch very shallow, angle wide.

##### *Bembrops* sp., SSF No. 233.- PLATE 121

**DISTRIBUTION:** Collected from the west coast near Orange River mouth in 142m. Attains at least 129 mm.

**MATERIAL:** 4/9 (2.2-2.4 mm OD, 114-129 mm TL), PEM 7772, 7765, 7771, 7773; Cape west coast; Id. MJS.

**Otolith shape:** Rounded-ovate. **Thickness:** Moderately thick. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Rounded; sculpture, lobed. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Rounded and notched. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, very low anterior colliculum, cauda filled with colliculum. **Pseudocolliculum:** Absent. **Ostium:** Narrow and elongate, slightly flared anteriorly, moderately deep. **Cauda:** Short, rounded and filled by colliculum. **Ostio-caudal differentiation:** Slight dorso-ventral constrictions. **Ostium/cauda:** 1:0.4, 1:0.5, 1:0.4, 1:0.3. **Collum:** Absent, step up to cauda. **Crista superior:** Well developed above ostium, high curved ridge above cauda. **Crista inferior:** Well developed below ostium, ridge below cauda. **Dorsal depression:** Deep and most of area depressed. **Ventral depression:** Depressed near margin, shallow post-caudal trough at margin. **Rostrum:** Large and sharply rounded to pointed. **Antirostrum:** Short, broad and sharply rounded. **Excisura:** Moderate, notch shallow, angle wide.



## MUGILOIDIDAE Nelson No. 388

**Family characteristics:** Three species described. Otoliths oblong-ovate to fusiform up to c. 6.3 mm OD. Heterosulcoid with ostial openings but may be ostio-caudal in largest specimens of at least one species. Ostium slightly flared, cauda approximately straight, flared, slightly flexed and deeper at tip. Heteromorph, colliculi indented and indistinct.

### Key

- 1a. Otolith oblong-ovate; dorsal area moderately broad; dorsal depression slit-like; crista inferior ridge-like under ostium and caudal tip; caudal tip deep and flared . . . . . *Parapercis punctulata* 234.4
- 1b. Otolith oblong-ovate to fusiform; dorsal area narrow; dorsal depression oval over most of area; crista inferior poorly defined at caudal tip . . . . . 2
- 2a. Ostium moderately narrow; posterior margin of otolith elongate and tapered, may be pointed, sharply rounded or blunt; ventral area narrow; rostrum elongate . . . . . *Parapercis maritzi* 234.2
- 2b. Ostium moderately broad; posterior margin of otolith sharply rounded; ventral area moderately broad; rostrum moderate and sharply rounded . . . . . *Parapercis robinsoni* 234.5

### *Parapercis maritzi*, SSF No. 234.2 PLATE 121

**DISTRIBUTION:** Occurs in Natal and Transkei. Attains c. 19 cm TL, 16 cm SL.

**MATERIAL:** 6/10 (5.4-6.3 mm OD, 148-192 mm TL), PEM 14996 (SAM 32442), 14998 (BPBM 34911), 14999 (RUSI 37319), 14995 (RUSI 37319), 15001 (SAM 32442), 14994 (BPBM 34911), [14997 (RUSI 35610 - holotype, otolith damaged), 15000 & 15002 (both RUSI 37319)]; off Transkei; Id. MEA. NOTE: These form part of the type material, the otoliths of which are held in JLBSII and PEM (Anderson 1992).

**Otolith shape:** Approximately fusiform. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral slightly concave. **Dorsal margin:** Slightly rounded or flat; **sculpture,** slightly irregular. **Ventral margin:** Slightly rounded or flat and approximately entire. **Posterior margin:** Pointed or rounded and slightly irregular. **Sulcus acusticus:** Ostial becoming ostio-caudal (c. 6.3 mm OD), heterosulcoid. **Colliculum:** Heteromorph, colliculi indented and indistinct. **Pseudocolliculum:** Absent. **Ostium:** Flared dorsally, deeper than cauda, with steep dorsal wall. **Cauda:** Gently flexed, with steep walls, poorly defined at tip. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:0.8, 1:0.9, 1:0.8, 1:0.8, 1:1, 1:1. **Collum:** Absent, step up to cauda. **Crista superior:** Ridge-like along ostium to mid-cauda, very poorly developed over posterior cauda. **Crista inferior:** Well developed along sulcus length, very poor at tip. **Dorsal depression:** Deep, covering most of the narrow dorsal area. **Ventral depression:** Absent, groove close to margin along most of sulcus. **Rostrum:** Large to elongate and sharply rounded to pointed. **Antirostrum:** Small, may be broad and rounded or sharply rounded. **Excisura:** Moderately wide, notch shallow, angle wide.

### *Parapercis punctulata*, SSF No. 234.4 PLATE 121

**DISTRIBUTION:** Seychelles, Amirantes, Mozambique, Mauritius and northern Natal. Attains 13 cm.

**MATERIAL:** 1/1 (3.05 mm OD, 93 mm TL), PEM 4620; Ledsman Shoal; Id. PCH.

**Otolith shape:** Oblong, ovate to fusiform. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded; **sculpture,** sinuate. **Ventral margin:** Slightly rounded and crenate. **Posterior margin:** Sharply rounded and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colli-**

**culum:** Heteromorph, colliculi indistinct and depressed. **Pseudocolliculum:** Absent. **Ostium:** Flared, deep, lies mainly on rostrum. **Cauda:** Approximately straight, deep, slightly flared and slightly flexed at tip. **Ostio-caudal differentiation:** Slight ventral constriction. **Ostium/cauda:** 1:1. **Collum:** Extremely low and narrow. **Crista superior:** Ridge-like from ostium to caudal tip, may be a break before tip where a groove from dorsal margin penetrates crista superior. **Crista inferior:** Ridge-like from ostium to caudal tip. **Dorsal depression:** Deep, elongate from ostium to mid-cauda, may be groove from margin penetrating crista. **Ventral depression:** Narrow and groove-like from ostium to cauda, posterior depression behind caudal tip. **Rostrum:** Moderate, broad, tapering to bluntly rounded tip. **Antirostrum:** Broad, tapered and sharply rounded. **Excisura:** Wide, notch deep, angle acute.

### *Parapercis robinsoni*, SSF No. 234.5 PLATE 121

**DISTRIBUTION:** Persian Gulf, south to Algoa Bay. Attains 30 cm.

**MATERIAL:** 5/8 (4.77-5.96 mm OD, 217-221 mm TL, 0033 not measured), PEM 2564, 2042, 6581 (RUSI 34097), 2041, 0033; Natal, ORI; Id. GJBR, MJS, PCH.

**Otolith shape:** Oblong to ovate. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded; **sculpture,** crenate. **Ventral margin:** Slightly rounded and irregular. **Posterior margin:** Sharply rounded and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, colliculi indented and indistinct. **Pseudocolliculum:** Absent. **Ostium:** Narrow and slightly flared, moderately deep. **Cauda:** Straight, flexed, flaring and deepening towards tip. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:1.4, 1:1.7, 1:1.2, 1:1.3, 1:1.8. **Collum:** Absent, slight step to cauda. **Crista superior:** Ridge-like from mid-ostium to mid-cauda, well developed elsewhere. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Oval and deep, covers most of narrow area. **Ventral depression:** Absent, groove from below rostrum to caudal tip near margin. **Rostrum:** Moderate and sharply rounded. **Antirostrum:** Absent or small and pointed. **Excisura:** Moderately wide, notch deep or shallow, angle wide.

## TRIPTERYGIIDAE Nelson No. 390

**Family characteristics:** Two species described. Otoliths oblong to fusiform and small, up to c. 3 mm OD. Heterosulcoid with ostial openings. Sulcus shallow with slightly flared ostium, cauda approximately straight, may be slightly flexed at tip. Heteromorph, colliculi very indistinct.

### Key

- 1a. Ostium dorsal margin slightly flared; cauda straight; dorsal depression absent; post-caudal trough may be present . . . . . *Cremnochorites capensis* 236.1
- 1b. Ostium narrow; caudal tip slightly flexed; dorsal depression shallow; post-caudal trough absent . . . . . *Helcogramma obtusirostre* 236.8

### *Cremnochorites capensis*, SSF No. 236.1 PLATE 121

**DISTRIBUTION:** False Bay to Port Alfred in 5-30 m. Attains 80 mm.

**MATERIAL:** 5/38 (1.5-2.9 mm OD, 35-73 mm TL), PEM 6055 & 6056 (both RUSI 17134), 5253, 5358, 6054 (RUSI 17134); Algoa Bay and Plettenberg Bay; Id. MJS, PCH.

**Otolith shape:** Oblong to fusiform. **Thickness:** Moderate. **Form:** - Mesial approximately flat, - Lateral approximately flat. **Dorsal margin:** Rounded; **sculpture,** approximately entire. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Sharply rounded or pointed and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior



and posterior rims raised. **Pseudocolliculum:** Absent. **Ostium:** Flared and shallow. **Cauda:** Approximately straight, shallow and short. **Ostio-caudal differentiation:** Dorsally constricted. **Ostium/cauda:** 1:0.8, 1:0.9, 1:0.7, 1:0.7, 1:0.6. **Collum:** Absent, step up to cauda in large otoliths (2.9 mm OD). **Crista superior:** Poorly developed along entire sulcus. **Crista inferior:** Well developed or low ridge along entire sulcus. **Dorsal depression:** Absent. **Ventral depression:** Absent, may be a groove and post-caudal trough present. **Rostrum:** Large, broad, tapered and pointed or sharply rounded. **Antirostrum:** Absent or minute and rounded. **Excisura:** Moderately wide, notch absent or very shallow, angle wide.

#### *Helcogramma obtusirostre*, SSF No. 236.8 PLATE 121

**DISTRIBUTION:** From Coffee Bay, Transkei to Red Sea and western Indian Ocean. Attains 45 mm.

**MATERIAL:** 2/3 (1.05, 1.3 mm OD, 25, 36 mm TL), PEM 2919, 2684; Botla Point and Sodwana; Id. MMS, MJS.

**Otolith shape:** Approximately oblong. **Thickness:** Moderate. **Form:** - Mesial flat, - Lateral flat. **Dorsal margin:** Rounded; **sculpture,** entire. **Ventral margin:** Rounded and entire. **Posterior margin:** Pointed or sharply rounded and entire. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Flared slightly, deeper than cauda. **Cauda:** Approximately straight, shallow, very slightly flexed at tip. **Ostio-caudal differentiation:** Very slight ventral narrowing. **Ostium/cauda:** 1:0.9, 2684 broken. **Collum:** Absent, step up to cauda. **Crista superior:** Poorly developed along length of sulcus, may be very low ridge over cauda. **Crista inferior:** Poorly developed along entire sulcus. **Dorsal depression:** Shallow and oval. **Ventral depression:** Absent, very shallow groove close to margin. **Rostrum:** Large, tapered and pointed. **Antirostrum:** Absent or small and rounded. **Excisura:** Moderately wide, notch very shallow (if present), angle wide.

### CLINIDAE Nelson No. 393

**Family characteristics:** Twenty two species described but no key provided because of large intraspecific ontogenetic variation and inadequate coverage of some of the larger sizes of some species. Otoliths oval or oblong-ovate, rarely the largest may be anvil-shaped. They are minute to small, up to 3.8 mm OD. Heterosulcoid with ostial or ostio-pseudocaudal openings, with the largest sometimes becoming ostio-caudal with growth. Usually heteromorph, rarely homomorph, colliculi are indistinct and may be indented or pitted. Collum usually present, but often low.

#### *Blennioclinus brachycephalus*, SSF No. 237.1 PLATE 122

**DISTRIBUTION:** From Luderitz Bay, Melkbosch Beach (north-west coast of Cape Peninsula) to the Kei River; common east of Cape Point. Attains 15 cm.

**MATERIAL:** 4/45 (0.8-1.5 mm OD, 50-97 mm TL), PEM 10393, 10299, 5510, 6024; Algoa Bay and vicinity; Id. MJS.

**Otolith shape:** Oval to obovate (1.5 mm OD). **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral slightly convex. **Dorsal margin:** Well rounded; **sculpture,** entire. **Ventral margin:** Slightly rounded and entire. **Posterior margin:** Sharply rounded and entire. **Sulcus acusticus:** Ostio-pseudocaudal becoming ostial (c. 1.5 mm OD), heterosulcoid. **Colliculum:** Heteromorph, indented and indistinct. **Pseudocolliculum:** Absent. **Ostium:** Flared, walls steep and deeper posteriorly, sulcus deepens with growth. **Cauda:** Flared, flexed ventrally. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:2.2, 1:2.5, 1:2, 1:2. **Collum:** Low. **Crista superior:** Ridge-like at neck, well developed over ostium, either

absent or poor at caudal tip. **Crista inferior:** Poorly developed under ostium, well developed at neck and below cauda. **Dorsal depression:** Oval, deepening with growth. **Ventral depression:** Absent. **Rostrum:** Short, broad and sharply rounded. **Antirostrum:** Absent or small and rounded. **Excisura:** Moderate, notch very shallow (if present), angle wide.

#### *Blennioclinus stella*, SSF No. 237.2 PLATE 122

**DISTRIBUTION:** From Algoa Bay to north of Durban. Attains 50 mm.

**MATERIAL:** 1/2 (0.75 mm OD, 45 mm TL), PEM 5509; Cape Recife; Id. MJS.

**Otolith shape:** Approximately oval. **Thickness:** Moderate. **Form:** - Mesial very slightly convex, - Lateral very slightly convex. **Dorsal margin:** Rounded; **sculpture,** entire. **Ventral margin:** Slightly rounded and entire. **Posterior margin:** Rounded and slightly irregular. **Sulcus acusticus:** Ostial, homosulcoid. **Colliculum:** Extremely low and indistinct. **Pseudocolliculum:** Absent. **Ostium:** Flared, dorsal wall steep. **Cauda:** Flared and shallow. **Ostio-caudal differentiation:** Absent. **Ostium/cauda:** 1:0.9. **Collum:** Present, low. **Crista superior:** Poorly developed along sulcus, absent at tip. **Crista inferior:** Very poorly developed along entire sulcus. **Dorsal depression:** Absent. **Ventral depression:** Absent. **Rostrum:** Short, broad and rounded. **Antirostrum:** Absent or minute and rounded. **Excisura:** Moderate, notch very shallow (if present), angle wide.

#### *Blennophis anguillaris*, SSF No. 237.3 PLATE 122

**DISTRIBUTION:** Luderitz Bay to East London, more common on west coast. Attains 30 cm.

**MATERIAL:** 1/1 (2.2 mm OD, 118 mm TL), PEM 9982; near Cape Recife; Id. MJS.

**Otolith shape:** Oblong-ovate. **Thickness:** Moderate. **Form:** - Mesial slightly convex to flat, - Lateral flat. **Dorsal margin:** Slightly rounded; **sculpture,** slightly irregular. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Rounded, slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, very low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Slightly flared, elongate, poorly defined ventral wall. **Cauda:** Straight, tip flexed, poorly defined posteriorly. **Ostio-caudal differentiation:** Slight ventral constriction. **Ostium/cauda:** 1:1.1. **Collum:** Absent, step up to cauda. **Crista superior:** Ridge-like above ostium, poorly developed or absent over cauda. **Crista inferior:** Well developed under anterior cauda, poorly developed at extremes. **Dorsal depression:** Oval, shallow and elongate. **Ventral depression:** Very shallow in mid-area. **Rostrum:** Moderate, broad and rounded. **Antirostrum:** Small and rounded. **Excisura:** Moderate, notch very shallow, angle wide.

#### *Blennophis striatus*, SSF No. 237.4 PLATE 122

**DISTRIBUTION:** From Saldanha Bay to East London. Attains 175 mm.

**MATERIAL:** 5/9 (1.15-3.2 mm OD, 54-146 mm TL), PEM 5178 (RUSI 11948), 10071, 10072, 10758, 10759; between Cape Recife and Tsitsikamma on Cape south coast; Id. MJS, PCH.

**Otolith shape:** Oblong-ovate to fusiform. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral flat. **Dorsal margin:** Rounded becoming flattened; **sculpture,** slightly irregular. **Ventral margin:** Approximately flat and slightly irregular. **Posterior margin:** Rounded becoming pointed and entire. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Deep, flared. **Cauda:** Straight, slightly flexed at tip. **Ostio-caudal differentiation:** Slight ventral constriction. **Ostium/cauda:** 1:1.2, 1:1.3, 1:1.2, 1:1.3, 1:1.4. **Collum:** Low. **Crista superior:** Well developed or



ridge-like from ostium to flexion, very poorly developed at tip. **Crista inferior:** Well developed under neck, poorly developed at extremes. **Dorsal depression:** Elongate and shallow. **Ventral depression:** Absent, may be shallow groove close to margin in large otoliths (3.2 mm OD), area becomes papillate below neck. **Rostrum:** Large, broad becoming elongate and sharply rounded. **Antirostrum:** Minute or small and sharply rounded. **Excisura:** Moderately wide, notch shallow, angle wide.

*Cirrhobarbis capensis*, SSF No. 237.7 PLATE 122

**DISTRIBUTION:** Rare west of Cape Point to Lamberts Bay. Common from False Bay to East London. Attains 35 cm.

**MATERIAL:** 5/95 (0.9-2.95 mm OD, 43-219 mm TL), PEM 10136, 10268, 10754, 10266, 2534; between Cape Recife and Schoenmakerskop; Id. MJS, PCH.

**Otolith shape:** Rounded-ovate becoming ovate (c. 3 mm OD). **Thickness:** Moderate. **Form:** - **Mesial:** flat, - **Lateral:** flat. **Dorsal margin:** Slightly rounded; **sculpture,** slightly irregular, may become notched. **Ventral margin:** Slightly rounded becoming flat (c. 2.5 mm OD) and slightly irregular. **Posterior margin:** Rounded to pointed (c. 1.9 mm OD) and slightly irregular. **Sulcus acusticus:** Ostial becoming ostio-caudal (c. 2.5 mm OD), heterosulcoid. **Colliculum:** Heteromorph, low nodular colliculi may be visible. **Pseudocolliculum:** Absent. **Ostium:** Flares, becoming very deep with growth. **Cauda:** Flared and flexed, deepens posteriorly and closer to margin with growth. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:1, 1:1.8, 1:1.3, 1:1.5, 1:7. **Collum:** Present, becoming wider and more distinct with growth. **Crista superior:** Well developed to ridge-like from ostium to cauda, poorly developed after flexion. **Crista inferior:** Well developed or ridge-like under neck, well developed at extremes. **Dorsal depression:** Elongate and oval. **Ventral depression:** Absent, may be ventral groove, ventral area nodular in large otoliths (>2.5 mm OD). **Rostrum:** Large, broad and rounded. **Antirostrum:** Small or moderate, rounded or pointed. **Excisura:** Moderate becoming moderately wide, notch shallow becoming deeper and wide with growth.

*Climacoporus navalis*, SSF No. 237.8 PLATE 122

**DISTRIBUTION:** From Still Bay to north of Port St Johns, Transkei. Attains 7 cm.

**MATERIAL:** 4/40 (1.1-1.4 mm OD, 46-70 mm TL), PEM 10462, 10461, 10460, 9941; between Cape Recife and Schoenmakerskop; Id. MJS.

**Otolith shape:** Oval becoming oval-ovate. **Thickness:** Moderate. **Form:** - **Mesial** convex, - **Lateral** convex. **Dorsal margin:** Slightly rounded or rounded; **sculpture,** entire. **Ventral margin:** Slightly rounded or flat and slightly irregular. **Posterior margin:** Sharply rounded and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Angled slightly dorsally, walls parallel and moderately deep. **Cauda:** Short, slightly flexed, poorly defined posteriorly, tip far from posterior wall. **Ostio-caudal differentiation:** Slightly ventrally constricted. **Ostium/cauda:** 1:0.9, 1:0.9, 1:1.1, 1:1.2. **Collum:** Present, distinct and moderately high. **Crista superior:** Low ridge from ostium to mid-cauda, poorly developed thereafter. **Crista inferior:** Low ridge below collum, poorly developed elsewhere. **Dorsal depression:** Very shallow. **Ventral depression:** Absent, area nodular in larger otoliths (>1.3 mm OD). **Rostrum:** Large, broad and sharply rounded. **Antirostrum:** Minute and rounded. **Excisura:** Moderate, notch very shallow, angle wide.

*Clinoporus biporosus*, SSF No. 237.9 PLATE 122

**DISTRIBUTION:** Saldanha Bay to False Bay. Attains 13 cm.

**MATERIAL:** 1/1 (0.70 mm OD, 41 mm TL), PEM 5357; Cape Recife; Id. PCH.

**Otolith shape:** Oval. **Thickness:** Moderate. **Form:** - **Mesial** convex, - **Lateral** convex. **Dorsal margin:** Rounded; **sculpture,** entire. **Ventral margin:** Slightly rounded and entire. **Posterior margin:** Rounded and entire. **Sulcus acusticus:** Ostial, homosulcoid. **Colliculum:** Homomorph, depressed colliculi. **Pseudocolliculum:** Absent. **Ostium:** Deepens towards collum, poorly defined in anterior. **Cauda:** Approximately oval, deep towards collum, poorly defined posteriorly. **Ostio-caudal differentiation:** Slightly ventrally constricted. **Ostium/cauda:** 1:1.2. **Collum:** Present, moderately narrow and low. **Crista superior:** Poorly developed along entire sulcus. **Crista inferior:** Poorly developed along entire sulcus. **Dorsal depression:** Absent. **Ventral depression:** Absent. **Rostrum:** Small and sharply rounded. **Antirostrum:** Minute and rounded. **Excisura:** Narrow, notch very shallow, angle wide.

*Clinus berrisfordi*, SSF No. 237.12 PLATE 123

**DISTRIBUTION:** False Bay to Schoenmakerskop. Attains 12 cm.

**MATERIAL:** 2/2 (1.9, 1.9 mm OD, 108, 96 mm TL), PEM 2293, 10906; Schoenmakerskop; Id. PCH, MJS.

**Otolith shape:** Rounded-ovate. **Thickness:** Moderate. **Form:** - **Mesial** convex, - **Lateral** slightly concave. **Dorsal margin:** Rounded; **sculpture,** entire. **Ventral margin:** Slightly rounded or flat and slightly irregular. **Posterior margin:** Sharply rounded, lobed and irregular. **Sulcus acusticus:** Ostial or ostio-caudal, heterosulcoid. **Colliculum:** Heteromorph with low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Flared dorsally and ventrally and moderately deep. **Cauda:** Flared, becomes shallower posteriorly, may open onto posterior margin. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:1.8, 1:1.7. **Collum:** Present and low. **Crista superior:** Well developed above ostium and neck, poorly developed over cauda, absent at tip. **Crista inferior:** Ridge-like below neck, poorly developed at extremes. **Dorsal depression:** Oval and shallow. **Ventral depression:** Margin depressed, area nodular. **Rostrum:** Short, broad and sharply rounded. **Antirostrum:** Short, broad and pointed. **Excisura:** Moderately wide, notch moderately deep, angle wide.

*Clinus cottoides*, SSF No. 237.14 PLATE 123

**DISTRIBUTION:** Olifants River mouth on the west coast to the Kei River in the east. Attains 15 cm.

**MATERIAL:** 4/105 (1.23-2.4 mm OD, 48-105 mm TL), PEM 5533, 10472, 10471, 5295; between Algoa Bay and Schoenmakerskop; Id. MJS.

**Otolith shape:** Oval becoming oval-ovate (c. 2.2 mm OD). **Thickness:** Moderately thick. **Form:** - **Mesial** convex, - **Lateral** convex. **Dorsal margin:** Rounded becoming slightly rounded; **sculpture,** entire. **Ventral margin:** Slightly rounded becoming flat and slightly irregular. **Posterior margin:** Rounded or sharply rounded and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, colliculi low. **Pseudocolliculum:** Absent. **Ostium:** Slightly flared, moderately deep. **Cauda:** Slightly flexed, shallowing and poorly defined posteriorly. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:1.5, 1:1.8, 1:1.9, 1:1.3. **Collum:** Present, low. **Crista superior:** Low ridge from ostium over neck, poorly developed or absent over cauda. **Crista inferior:** Low ridge below ostium and cauda, poorly developed or absent at tip. **Dorsal depression:** Oval and very shallow. **Ventral depression:** Narrow groove under crista, area may be nodular. **Rostrum:** Short, broad, pointed or sharply rounded. **Antirostrum:** Absent or small and



pointed. **Excisura**: Moderate becoming moderately wide, notch very shallow (if present), angle wide.

***Clinus helenae*, SSF No. 237.15 PLATE 123**

**DISTRIBUTION**: Rare, from Boknes to the Bashee River. Attains 10 cm.

**MATERIAL**: 1/1 (0.8 mm OD, 27 mm TL), PEM 14823; Schoenmakerskop; Id. MJS.

**Otolith shape**: Oval. **Thickness**: Moderate. **Form**: - Mesial convex, - Lateral convex. **Dorsal margin**: Rounded; **sculpture**, entire. **Ventral margin**: Slightly rounded and entire. **Posterior margin**: Rounded and entire. **Sulcus acusticus**: Ostial, homosulcoid. **Colliculum**: Homomorph, colliculi indented. **Pseudocolliculum**: Absent. **Ostium**: Oval, angled slightly dorsally, narrows anteriorly. **Cauda**: Oval, deep, poorly defined walls. **Ostio-caudal differentiation**: Slight ventral constrictions. **Ostium/cauda**: 1:1. **Collum**: Present, moderately high. **Crista superior**: Poorly developed along entire sulcus. **Crista inferior**: Poorly developed. **Dorsal depression**: Oval and shallow. **Ventral depression**: Absent. **Rostrum**: Short, broad and sharply rounded. **Antirostrum**: Absent. **Excisura**: Narrow, notch absent.

***Clinus robustus*, SSF No. 237.19 PLATE 123**

**DISTRIBUTION**: From the Cape to East London. Attains 50 cm.

**MATERIAL**: 3/4 (2.3-3.8 mm OD, 150-332 mm TL), PEM 10896, 0646, 10894; Cape Recife and Schoenmakerskop; Id. MJS, M-L. Penrith.

**Otolith shape**: Approximately ovate becoming anvil-shaped (c. 3 mm OD). **Thickness**: Moderate. **Form**: - Mesial flat, - Lateral convex or flat. **Dorsal margin**: Slightly rounded or flat; **sculpture**, slightly irregular. **Ventral margin**: Slightly rounded or flat and slightly irregular. **Posterior margin**: Oblique and pointed or notched and irregular. **Sulcus acusticus**: Ostial becoming ostio-caudal with growth (c. 3 mm OD), heterosulcoid. **Colliculum**: Heteromorph, indistinct colliculi. **Pseudocolliculum**: Absent. **Ostium**: Flared, becoming very wide but reduced with growth, anterior margin erodes with growth. **Cauda**: Straight, with strong flex which undercuts ventral area, posterior margin of otolith becomes eroded with growth and meets sulcus. **Ostio-caudal differentiation**: Ventral constriction. **Ostium/cauda**: 1:1.1, 1:1.4, 1:1.2. **Collum**: Present and narrow. **Crista superior**: Well developed above ostium to anterior cauda, poorly developed or absent at tip. **Crista inferior**: Poorly developed under ostium, well developed under cauda. **Dorsal depression**: Oval and shallow, covers most of dorsal area. **Ventral depression**: Absent, margin depressed. **Rostrum**: Large, broad and sharply rounded or blunt, narrower and elongate with growth (c. 3.8 mm OD). **Antirostrum**: Moderately broad, sharply rounded or rounded. **Excisura**: Moderately wide becoming wide, notch moderately deep, angle wide.

***Clinus superciliosus*, SSF No. 237.22 PLATE 123**

**DISTRIBUTION**: From 18°59'S on the west coast to the Kei R. Attains 30 cm.

**MATERIAL**: 5/105 (1.3-3.0 mm OD, 62-185 mm TL), PEM 5285, 10102, 10098, 3880 (RUSI 11955), 5291; Algoa Bay and vicinity; Id. MJS, PCH.

**Otolith shape**: Oval-ovate. **Thickness**: Moderate. **Form**: - Mesial slightly convex, - Lateral flat. **Dorsal margin**: Rounded; **sculpture**, lobed and irregular. **Ventral margin**: Rounded and slightly irregular. **Posterior margin**: Pointed, lobed or irregular. **Sulcus acusticus**: Ostial, heterosulcoid. **Colliculum**: Heteromorph, low colliculi. **Pseudocolliculum**: Absent. **Ostium**: Deep and flared. **Cauda**: Flared, flexed posteriorly, deep on ventral side, posterior wall poorly defined. **Ostio-caudal differentiation**: Ventral constriction. **Ostium/cauda**: 1:1.4, 1:1.2, 1:1.5, 1:1.7,

1:1.6. **Collum**: Low. **Crista superior**: Ridge-like from ostium to flexion, poorly developed thereafter. **Crista inferior**: Low ridge at neck, poorly developed at extremes. **Dorsal depression**: Oval and shallow, covers most of area. **Ventral depression**: Narrow and shallow under crista, area uneven. **Rostrum**: Large, broad and pointed. **Antirostrum**: Small and sharply rounded. **Excisura**: Moderate, notch shallow, angle wide.

***Clinus taurus*, SSF No. 237.23 PLATE 123**

**DISTRIBUTION**: Mowe Point (Namibia) to Port Alfred. Attains 23 cm.

**MATERIAL**: 4/16 (1.6-3.0 mm OD, 60-130 mm TL), PEM 10023, 10017, 10021, 10014; Chelsea Point near Cape Recife; Id. MJS.

**Otolith shape**: Oval-ovate. **Thickness**: Moderately thick. **Form**: - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin**: Rounded; **sculpture**, irregular. **Ventral margin**: Slightly rounded and slightly irregular. **Posterior margin**: Pointed, oblique and slightly irregular. **Sulcus acusticus**: Ostial, heterosulcoid. **Colliculum**: Heteromorph, indistinct indented colliculi. **Pseudocolliculum**: Absent. **Ostium**: Slightly angled dorsally, moderately deep and walls parallel. **Cauda**: Moderately deep, flexed and flared posteriorly with poorly defined tip. **Ostio-caudal differentiation**: Slight ventral constriction. **Ostium/cauda**: 1:1.2, 1:1.1, 1:0.9, 1:0.8. **Collum**: Present, low. **Crista superior**: Low ridge from ostium to neck, poorly developed over cauda and tip. **Crista inferior**: Well developed below ostium, ridge-like below neck and anterior cauda, absent at tip. **Dorsal depression**: Oval and shallow. **Ventral depression**: Absent. **Rostrum**: Short, moderately broad and sharply rounded. **Antirostrum**: Absent or minute and rounded. **Excisura**: Narrow, notch very shallow (if present), angle wide.

***Clinus venustis*, SSF No. 237.24 PLATE 124**

**DISTRIBUTION**: From Luderitz Bay to Port Alfred. Attains 12 cm.

**MATERIAL**: 4/21 (1.5-2.0 mm OD, 75-96 mm TL), PEM 10303, 6047 (RUSI 17133), 9980, 6045 (RUSI 17133), [6046 & 6048 (both RUSI 17133)]; between Plettenberg Bay and Schoenmakerskop; Id. MJS, PCH.

**Otolith shape**: Oval-ovate. **Thickness**: Moderate. **Form**: - Mesial slightly convex, - Lateral flat. **Dorsal margin**: Raised and rounded becoming flattened (c. 2 mm OD); **sculpture**, entire. **Ventral margin**: Slightly rounded and entire. **Posterior margin**: Pointed, oblique and entire. **Sulcus acusticus**: Ostio-pseudocaudal, heterosulcoid. **Colliculum**: Heteromorph, indistinct colliculi. **Pseudocolliculum**: Absent. **Ostium**: Angled slightly dorsally, flared, narrowing towards excisura. **Cauda**: Straight, flexed and flared near tip, deeper towards collum, posterior tip poorly defined. **Ostio-caudal differentiation**: Slightly ventrally constricted. **Ostium/cauda**: 1:1.5, 1:1.4, 1:1.1, 1:1.4. **Collum**: Low and broad. **Crista superior**: Well developed or ridge-like from ostium to flexion, poorly developed at tip. **Crista inferior**: Well developed or ridge-like from mid-ostium to mid-cauda, moderately well developed at extremes. **Dorsal depression**: Elongate, oval and shallow, covering most of area. **Ventral depression**: Absent, area may be papillose. **Rostrum**: Large, broad and sharply rounded. **Antirostrum**: Absent or minute and sharply rounded or rounded. **Excisura**: Moderate, notch absent or very shallow, angle wide.

***Fucomimus mus*, SSF No. 237.26 PLATE 124**

**DISTRIBUTION**: From False Bay to Coffee Bay (32°S). Attains 10 cm.

**MATERIAL**: 3/13 (0.8-0.95 mm OD, 72-87 mm TL), PEM 5506, 5505, 5507; Cape Recife; Id. MJS.

**Otolith shape**: Oval-ovate. **Thickness**: Moderate. **Form**: - Mesial slightly convex, - Lateral approximately flat. **Dorsal**



margin: Rounded; sculpture, entire. **Ventral margin:** Slightly rounded or flat and entire. **Posterior margin:** Pointed and slightly irregular. **Sulcus acusticus:** Ostio-caudal or ostio-pseudocaudal, heterosulcoid. **Colliculum:** Heteromorph, colliculi indistinct. **Pseudocolliculum:** Absent. **Ostium:** Moderate, narrow, walls parallel. **Cauda:** Approximately straight ventrally, flared dorsally, pit-like near collum. **Ostio-caudal differentiation:** Slight ventral constriction. **Ostium/cauda:** 1:1.5, 1:1.4, 1:1.4. **Collum:** Present, low. **Crista superior:** Well developed or low ridge above ostium, poor elsewhere. **Crista inferior:** Poorly developed along entire sulcus, absent at tip. **Dorsal depression:** Oval and shallow. **Ventral depression:** Absent, may be a shallow groove in mid-area. **Rostrum:** Broad and sharply rounded. **Antirostrum:** Minute and rounded or sharply rounded. **Excisura:** Moderate, notch very shallow, angle wide.

***Muraenoclinus dorsalis*, SSF No. 237.27 PLATE 124**

**DISTRIBUTION:** From Luderitz Bay to southern Natal. Attains 10 cm.

**MATERIAL:** 2/2 (0.6, 0.75 mm OD, 38, 41 mm TL), PEM 2563, 5321; Chelsea Point near Cape Recife; Id. MJS, PCH.

**Otolith shape:** Oval. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral convex to flat. **Dorsal margin:** Rounded; sculpture, entire. **Ventral margin:** Slightly rounded and entire. **Posterior margin:** Rounded and entire. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Colliculi not visible. **Pseudocolliculum:** Absent. **Ostium:** Approximately oval with narrow excisura. **Cauda:** Slightly flexed, deeper at collum, poorly defined posteriorly. **Ostio-caudal differentiation:** Slightly ventrally constricted. **Ostium/cauda:** 1:1, 1:0.8. **Collum:** Narrow. **Crista superior:** Poorly developed along entire sulcus. **Crista inferior:** Poorly developed along entire sulcus. **Dorsal depression:** Absent. **Ventral depression:** Absent. **Rostrum:** Short, broad and pointed. **Antirostrum:** Absent or minute and rounded. **Excisura:** Narrow, notch very shallow (if present), angle wide.

***Pavoclinus graminis*, SSF No. 237.28 PLATE 124**

**DISTRIBUTION:** From False Bay to Inhambane. Attains 16 cm. **MATERIAL:** 4/46 (1.1-1.6 mm OD, 73-120 mm TL), PEM 5495, 9963, 10740, 10745; between Cape Recife and Schoenmakerskop; Id. MJS.

**Otolith shape:** Oval to oblong-ovate. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral slightly convex to flat. **Dorsal margin:** Rounded to slightly rounded; sculpture, slightly irregular. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Sharply rounded or pointed and slightly irregular. **Sulcus acusticus:** Ostial to ostio-pseudocaudal (c. 1.6 mm OD), heterosulcoid. **Colliculum:** Heteromorph, colliculi low. **Pseudocolliculum:** Absent. **Ostium:** Flared, slightly flexed ventral wall, deep towards collum. **Cauda:** Moderately deep, steep walls anteriorly, posterior wall poorly defined. **Ostio-caudal differentiation:** Slightly ventrally constricted. **Ostium/cauda:** 1:1.7, 1:1.3, 1:1.3, 1:1.1. **Collum:** Narrow and low. **Crista superior:** Well developed or ridge-like over ostium and cauda, very poorly developed after flexion. **Crista inferior:** Well developed or ridge-like under neck, poorly developed at extremes. **Dorsal depression:** Oval and shallow. **Ventral depression:** Absent. **Rostrum:** Large, broad and sharply rounded. **Antirostrum:** Absent or minute and rounded. **Excisura:** Moderate, notch very shallow (if present), angle wide.

***Pavoclinus laurentii*, SSF No. 237.30 PLATE 124**

**DISTRIBUTION:** Port Alfred to Inhambane. Attains 13 cm.

**MATERIAL:** 1/3 (0.7 mm OD, 41 mm TL), PEM 4106; Tsitsikamma; Id. MJS.

**Otolith shape:** Oval. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral convex. **Dorsal margin:** Rounded; sculpture, entire. **Ventral margin:** Rounded and entire. **Posterior margin:** Rounded and entire. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, very low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Angled dorsally, flares and narrows to excisura, moderately deep. **Cauda:** Approximately oval and flexed, moderately deep, posterior wall poorly defined. **Ostio-caudal differentiation:** Slight ventral constriction. **Ostium/cauda:** 1:1. **Collum:** Moderate and narrow. **Crista superior:** Well developed over ostium, poorly developed over cauda, absent at tip. **Crista inferior:** Poorly developed under ostium, low ridge under neck, very poorly developed at tip. **Dorsal depression:** Oval and shallow. **Ventral depression:** Absent. **Rostrum:** Short, broad and sharply rounded. **Antirostrum:** Absent. **Excisura:** Narrow, notch extremely shallow, angle wide.

***Pavoclinus mentalis*, SSF No. 237.32 PLATE 124**

**DISTRIBUTION:** From Algoa Bay to St Lucia. Attains 30 cm.

**MATERIAL:** 1/1 (1.9 mm OD, 275 mm TL), PEM0367; Transkei; Id. GJBR.

**Otolith shape:** Anvil-shaped (c. 1.9 mm OD). **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral slightly convex. **Dorsal margin:** Slightly rounded; sculpture, irregular. **Ventral margin:** Slightly rounded and emarginate, slightly irregular. **Posterior margin:** Pointed, emarginate and irregular. **Sulcus acusticus:** Ostio-caudal, homosulcoid. **Colliculum:** Homomorph, very low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Deep, reduced and flared. **Cauda:** Deep and flared, posterior margin eroded. **Ostio-caudal differentiation:** Very slight ventral constriction. **Ostium/cauda:** 1:1.3. **Collum:** Waisted, high and prominent. **Crista superior:** Well developed along entire sulcus. **Crista inferior:** Ridge-like along entire sulcus. **Dorsal depression:** Oval and irregular, dorsal area columnar. **Ventral depression:** Absent, elongate groove under crista, area columnar. **Rostrum:** Short, broad and blunt. **Antirostrum:** Very short, broad and rounded. **Excisura:** Moderately wide, notch moderately deep, angle wide.

***Pavoclinus pavo*, SSF No. 237.34 PLATE 124**

**DISTRIBUTION:** From Luderitz Bay to the Kei River (Transkei). Attains 15 cm.

**MATERIAL:** 4/25 (0.7-1.1 mm OD, 44-68 mm TL), PEM 6050 (RUSI 17129), 9897, 10316, 9894, [6049 (RUSI 17129)]; between Cape Recife and Plettenberg Bay; Id. MJS, PCH.

**Otolith shape:** Oval. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral flat. **Dorsal margin:** Rounded; sculpture, entire. **Ventral margin:** Slightly rounded and entire. **Posterior margin:** Sharply rounded and entire. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Moderately deep, slightly flared with steep dorsal walls. **Cauda:** Moderately deep, slightly flexed, poorly defined posterior wall. **Ostio-caudal differentiation:** Slightly ventrally constricted. **Ostium/cauda:** 1:0.8, 1:1.1, 1:1, 1:0.7. **Collum:** Low. **Crista superior:** Well developed over ostium, very poorly developed at absent over cauda. **Crista inferior:** Low ridge under collum, poorly developed at extremes. **Dorsal depression:** Oval and shallow. **Ventral depression:** Absent, may be shallow groove in mid-area. **Rostrum:** Short, broad and rounded. **Antirostrum:** Absent or short and rounded. **Excisura:** Moderate, notch very shallow, angle wide.

***Pavoclinus profundus*, SSF No. 237.35 PLATE 125**

**DISTRIBUTION:** Off Knysna to Algoa Bay. Attains 5 cm.

**MATERIAL:** 3/5 (0.6-1.1 mm OD, 48-96 mm TL), PEM 6026, 5358, 6025; Chelsea Point and Cape Recife; Id. MJS, PCH.



**Otolith shape:** Oval-ovate. **Thickness:** Moderate. **Form:** - Mesial flat, - Lateral flat. **Dorsal margin:** Rounded; **sculpture,** entire. **Ventral margin:** Slightly rounded and entire. **Posterior margin:** Sharply rounded or rounded and entire. **Sulcus acusticus:** Ostial or ostio-pseudocaudal (c. 1.1 mm OD), heterosulcoid. **Colliculum:** Heteromorph, colliculi low. **Pseudocolliculum:** Absent. **Ostium:** Flared and narrows to excisura. **Cauda:** Straight, flexed near tip. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:1.3, 1:1.1, 1:1. **Collum:** Low. **Crista superior:** Well developed over ostium, poorly developed over cauda, absent at tip. **Crista inferior:** Poorly developed, becoming well developed below neck, poor at extremes. **Dorsal depression:** Oval and shallow. **Ventral depression:** Absent. **Rostrum:** Short, broad and sharply rounded or pointed. **Antirostrum:** Absent or minute and rounded. **Excisura:** Narrow, notch shallow (if present), angle wide.

***Xenopoclinus leprosus*, SSF No. 237.38 PLATE 125**

**DISTRIBUTION:** From Orange River mouth to Algoa Bay. Attains 8 cm.

**MATERIAL:** 2/2 (0.95, 1.1 mm OD, 58, 60 mm TL), PEM 5359, 5225; Cape Recife and Algoa Bay; Id. PCH.

**Otolith shape:** Oval-ovate. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral slightly convex. **Dorsal margin:** Rounded; **sculpture,** entire. **Ventral margin:** Slightly rounded and entire. **Posterior margin:** Sharply rounded and entire. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, colliculi indistinct, pitted. **Pseudocolliculum:** Absent. **Ostium:** Elongate with parallel sides and a pit near collum. **Cauda:** Short, deep and pitted. **Ostio-caudal differentiation:** Slightly ventrally constricted. **Ostium/cauda:** 1:0.6, 1:0.8. **Collum:** Present, distinct. **Crista superior:** Poorly developed along entire sulcus. **Crista inferior:** Poorly developed along entire sulcus. **Dorsal depression:** Absent. **Ventral depression:** Absent, may be groove across posterior tip of otolith. **Rostrum:** Large, broad and sharply rounded. **Antirostrum:** Absent or minute and rounded. **Excisura:** Moderate, notch shallow (if present), angle wide.

**BLENNIIDAE Nelson No. 395**

**Family characteristics:** Fourteen species described. Otoliths small (up to c. 2.5 mm OD) and oval or oval-ovate, rarely discoid, heterosulcoid, usually with ostial openings but rarely ostio-caudal or ostio-pseudocaudal. Ostium usually flared, cauda usually short, slightly flexed and flared. Heteromorph, colliculi usually low, reduced or pit-like.

**Key**

- 1a. Otolith discoid; rostrum and antirostrum similar sized; colliculum fused, indented in centre with raised edges . . . . . *Plagiotremus tapeinosoma* 235.38
- 1b. Otolith oval or oblong-ovate; rostrum larger than antirostrum; colliculum indented and indistinct . . . . . 2
- 2a. Ostium bulbous and drooping ventrally . . . . . *Parablennius cornutus* 235.31 and *P. pilicornis* 235.33
- 2b. Ostium flared or slightly flared . . . . . 3
- 3a. Cauda narrow and deep (oval or slit-like); dorsal margin of otolith well rounded . . . . . *Xiphasia setifer* 235.42
- 3b. Cauda flexed and/or flared; dorsal margin rounded, raised or slightly rounded . . . . . 4

- 4a. Cauda straight then flexed; ventral area of otolith usually with groove or depressed margin; caudal tip almost reaches margin . . . . . 5
- 4b. Cauda flared and flexed; ventral margin of otolith usually not depressed nor grooved; caudal tip not reaching margin . . . . . 6
- 5a. Crista superior ridge-like and straight; cauda broad; sulcus opening ostio-caudal, caudal tip joins ventral groove . . . . . *Antennablennius australis* 235.2
- 5b. Crista superior slightly curved; cauda moderately narrow and flexed, ends close to ventral margin . . . . . *Pereulixia kosiensis* 235.34, *Istiblennius edentulus* 235.18
- 6a. Rostrum tapered and pointed . . . . . *Omobranchus banditus* 235.25
- 6b. Rostrum broad and angled, rounded or sharply rounded: *Chalaroderma ocellata* 235.7, *Cirripectes castaneus* 235.9, *Ecsenius midas* 235.10, *Exallias brevis* 235.14, *Istiblennius dussumieri* 235.17, *Omobranchus woodi* 235.30, *Scartella emarginata* 235.40.

***Antennablennius australis*, SSF No. 235.2 PLATE 125**

**DISTRIBUTION:** From Port Elizabeth to the Red Sea. Attains 7 cm SL.

**MATERIAL:** 1/1 (1.0 mm OD, 53 mm TL), 0785H; Botla Point; Id. MMS.

**Otolith shape:** Oval-ovate. **Thickness:** Moderately thick. **Form:** - Mesial very convex, - Lateral slightly concave. **Dorsal margin:** Rounded; **sculpture,** entire. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Sharply rounded and slightly irregular. **Sulcus acusticus:** Ostio-caudal, heterosulcoid. **Colliculum:** Heteromorph, low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Flared, steep dorsal wall. **Cauda:** Straight becoming strongly flexed and deeper, joining ventral groove and opening onto ventral margin. **Ostio-caudal differentiation:** Slightly constricted ventrally. **Ostium/cauda:** 1:1.2. **Collum:** Absent. **Crista superior:** Ridge-like from ostium to mid-cauda, moderately well developed over posterior cauda. **Crista inferior:** Well developed below ostium and cauda. **Dorsal depression:** Oval and deep, covering most of area. **Ventral depression:** Absent, groove from ostium to caudal tip. **Rostrum:** Short, broad and rounded. **Antirostrum:** Very short, broad and rounded. **Excisura:** Moderate, notch shallow, angle wide.

***Chalaroderma ocellata*, SSF No. 235.7 PLATE 125**

**DISTRIBUTION:** Known only from Saldanha Bay to Port Elizabeth. Attains 7 cm SL.

**MATERIAL:** 4/6 (1.0-1.8 mm OD, 41-88 mm TL), PEM 5644, 5363, 5275, 6044; between Plettenberg Bay and Cape Recife; Id. MJS, PCH.

**Otolith shape:** Oval-ovate. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral flat. **Dorsal margin:** Rounded; **sculpture,** slightly irregular. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Sharply rounded and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, extremely indistinct and indented. **Pseudocolliculum:** Absent. **Ostium:** Flared, deeper than cauda, dorsally angled anteriorly. **Cauda:** Deeper towards collum, with slightly flexed pit. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:1.4, 1:1.1, 1:1.4, 1:1.4. **Collum:** Low. **Crista superior:** Well developed over ostium, poorly developed to absent elsewhere. **Crista inferior:** Well developed below collum, very poorly developed or absent elsewhere. **Dorsal depression:** Absent. **Ventral depression:** Absent. **Rostrum:** Short becoming moderate (c. 1.8 mm OD), broad and rounded. **Antirostrum:** Very short, broad and rounded. **Excisura:** Moderate, notch shallow, angle wide.

**rostrum:** Very short, broad and rounded. **Excisura:** Moderate, notch very shallow, angle wide.

*Cirripectes castaneus*, SSF No. 235.9 PLATE 125

**DISTRIBUTION:** Widely distributed in Indo-West Pacific; extends south to Sodwana Bay. Attains 9.5 cm SL.

**MATERIAL:** 2/2 (1.1, 1.2 mm OD, 53, 70 mm TL), 0481H, 0480H; Brighton Beach, Durban; Id. TH.

**Otolith shape:** Oval-ovate. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral flat. **Dorsal margin:** Rounded; **sculpture,** slightly irregular. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Sharply rounded and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, colliculi low. **Pseudocolliculum:** Absent. **Ostium:** Walls parallel and deeper towards collum. **Cauda:** Slightly flexed and deeper at collum, poorly defined posteriorly. **Ostio-caudal differentiation:** Slightly ventrally constricted. **Ostium/cauda:** 1:1.2, 1:1.2. **Collum:** Low. **Crista superior:** Well developed over ostium and neck, very poorly developed to absent over cauda. **Crista inferior:** Well developed below collum, very poorly developed elsewhere. **Dorsal depression:** Absent. **Ventral depression:** Absent. **Rostrum:** Short, broad and rounded. **Antirostrum:** Very short, broad and rounded. **Excisura:** Moderate, notch very shallow, angle wide.

*Ecsenius midas*, SSF No. 235.10 PLATE 125

**DISTRIBUTION:** Red Sea and east Africa to Marquesas Is.; known only from Sodwana in this area. Attains 10 cm SL.

**MATERIAL:** 1/1 (1.55 mm OD, 89 mm TL), 0759H; Sodwana; Id. JER.

**Otolith shape:** Oval-ovate. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral flat. **Dorsal margin:** Rounded; **sculpture,** slightly irregular. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Sharply rounded and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, very low, indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Flared, deep and dorsal rostral edge raised. **Cauda:** Flared dorsally and ventrally, deeper at collum, poorly defined posterior wall. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:1. **Collum:** Low. **Crista superior:** Low ridge over ostium and collum, very poor to absent over cauda. **Crista inferior:** Moderately well developed under ostium and collum, absent at tip. **Dorsal depression:** Oval and shallow. **Ventral depression:** Absent, groove present close to margin. **Rostrum:** Short, moderately broad and sharply rounded. **Antirostrum:** Very short, broad and rounded or sharply rounded. **Excisura:** Moderate, notch shallow, angle wide.

*Exallias brevis*, SSF No. 235.14 PLATE 125

**DISTRIBUTION:** Red Sea to central Pacific; south to Sodwana Bay. Attains 12 cm SL.

**MATERIAL:** 2/2 (1.65, 2.05 mm OD, 64, 95 mm TL), PEM 15655, 15654; Comoro Ids; Id. PCH.

**Otolith shape:** Approximately oval. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral slightly concave. **Dorsal margin:** Rounded, slightly raised; **sculpture,** slightly irregular. **Ventral margin:** Slightly rounded to flat and slightly irregular. **Posterior margin:** Sharply rounded, may be notched. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, very low, indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Slightly flared dorsally, colliculum indented in centre. **Cauda:** Curved along its length, poorly defined posterior wall. **Ostio-caudal differentiation:** Dorsally and slightly ventrally constricted. **Ostium/cauda:** 1:1.3, 1:1.5. **Collum:** Very low. **Crista superior:** Well developed over entire sulcus, absent at caudal tip. **Crista inferior:** Well developed under entire sulcus. **Dorsal depression:**

Absent. **Ventral depression:** Absent, shallow groove in mid-area under sulcus. **Rostrum:** Broad, angled and pointed. **Antirostrum:** Absent. **Excisura:** Moderately wide, notch very shallow, angle wide.

*Istiblennius dussumieri*, SSF No. 235.17 PLATE 125

**DISTRIBUTION:** Widely distributed in Indo-Pacific, south to Bashee River mouth, Transkei. Attains 10 cm SL.

**MATERIAL:** 2/3 (1.3 mm OD, 0479H lost, 90, 107 mm TL), 0479H, 0478H; Brighton Beach; Id. TH.

**Otolith shape:** Oval-ovate. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral approximately flat. **Dorsal margin:** Rounded; **sculpture,** slightly irregular. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Sharply rounded or rounded and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Colliculi not visible. **Pseudocolliculum:** Absent. **Ostium:** Flared, ventral wall irregular and poorly defined. **Cauda:** Flexed ventrally, has steep ventral wall, poorly defined posteriorly. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:1, 1:0.9. **Collum:** Absent, step up to cauda. **Crista superior:** Well developed over ostium and neck, very poor or absent over cauda. **Crista inferior:** Low ridge from ostium along cauda, absent at tip. **Dorsal depression:** Shallow and oval. **Ventral depression:** Oval and shallow under cauda near margin. **Rostrum:** Short, moderately broad and rounded. **Antirostrum:** Short, broad and rounded. **Excisura:** Moderate, notch shallow, angle wide.

*Istiblennius edentulus*, SSF No. 235.18 PLATE 126

**DISTRIBUTION:** Widely distributed in Indo-Pacific, south to East London. Attains 13 cm SL.

**MATERIAL:** 1/1 (1.8 mm OD, 125 mm TL), 0639H; Brighton Beach; Id. TH.

**Otolith shape:** Oblong-ovate. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral flat. **Dorsal margin:** Slightly rounded or flat; **sculpture,** slightly irregular. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Rounded and slightly irregular. **Sulcus acusticus:** Ostial, may appear ostio-caudal, heterosulcoid. **Colliculum:** Heteromorph, very low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Flared, moderately deep, ventral margin irregular. **Cauda:** Flared and flexed posteriorly, ventral wall steep. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:0.9. **Collum:** Absent, step up to cauda. **Crista superior:** Ridge-like over ostium and collum, very poorly developed over cauda. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Oval and shallow. **Ventral depression:** Absent. **Rostrum:** Short, moderately broad and sharply rounded. **Antirostrum:** Small and rounded. **Excisura:** Moderately wide, notch very shallow, angle wide.

*Omobranchus banditus*, SSF No. 235.25 PLATE 126

**DISTRIBUTION:** Bazaruto to Transkei, juveniles to Port Alfred, ?Mauritius. Attains 6 cm SL.

**MATERIAL:** 1/2 (0.8 mm OD, 75 mm TL), 0237H; Swartkops Drift; Id. TH.

**Otolith shape:** Oval-ovate. **Thickness:** Moderately thick. **Form:** - Mesial slightly convex, - Lateral slightly convex. **Dorsal margin:** Rounded; **sculpture,** slightly irregular. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Sharply rounded, crenate or irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, colliculi very indistinct. **Pseudocolliculum:** Absent. **Ostium:** Elongate, deep in centre. **Cauda:** Flexed slightly and poorly defined posteriorly. **Ostio-caudal differentiation:** Slightly ventrally constricted. **Ostium/cauda:** 1:0.8. **Collum:** Absent. **Crista superior:** Well



developed over ostium, absent elsewhere. **Crista inferior:** Well developed at neck, very poor to absent elsewhere. **Dorsal depression:** Absent. **Ventral depression:** Absent. **Rostrum:** Moderate, tapered and pointed. **Antirostrum:** Short, broad and sharply rounded. **Excisura:** Moderately wide, notch shallow, angle acute.

***Omobranchus woodi*, SSF No. 235.30 PLATE 126**

**DISTRIBUTION:** Known only from East London to Knysna. Attains 8 cm SL.

**MATERIAL:** 2/3 (0.75, 1.05, mm OD, 57, 75 mm TL), PEM 1882 (RUSI 9028), 1885 (RUSI 9029); locality unknown; Id. PCH.

**Otolith shape:** Oval-ovate. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral slightly convex. **Dorsal margin:** Well rounded; **sculpture**, irregular. **Ventral margin:** Slightly rounded and irregular. **Posterior margin:** Rounded or pointed and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low, indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Deep, slightly flared. **Cauda:** Slightly flexed and poorly defined posteriorly. **Ostio-caudal differentiation:** Slightly ventrally constricted. **Ostium/cauda:** 1:1.4, 1:1.2. **Collum:** Absent. **Crista superior:** Poorly developed above ostium, absent elsewhere. **Crista inferior:** Well developed below neck, very poorly developed elsewhere. **Dorsal depression:** Absent. **Ventral depression:** Absent, groove or depressed margin may be present. **Rostrum:** Short, broad and sharply rounded or pointed. **Antirostrum:** Short and sharply rounded. **Excisura:** Moderate, notch shallow, angle wide.

***Parablennius cornutus*, SSF No. 235.31 PLATE 126**

**DISTRIBUTION:** Northern Namibia to Sodwana Bay. Attains 15 cm SL.

**MATERIAL:** 4/19 (1.5-1.9 mm OD, 47-90 mm TL), PEM 9998, 10295, 9996, 9999; Chelsea Point and near Schoenmakerskop; Id. MJS.

**Otolith shape:** Oval-ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral flat. **Dorsal margin:** Well rounded; **sculpture**, slightly irregular. **Ventral margin:** Slightly rounded and crenate or slightly irregular. **Posterior margin:** Sharply rounded and entire. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Bulbous ventrally, narrows to excisura. **Cauda:** Flexed ventrally, with oval colliculum and poorly defined posterior wall. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:1, 1:1, 1:0.9, 1:1. **Collum:** Low. **Crista superior:** Well developed over ostium and collum, poorly developed over cauda. **Crista inferior:** Well developed under posterior ostium and collum, absent at extremes. **Dorsal depression:** Absent. **Ventral depression:** Absent but margin may be depressed. **Rostrum:** Short, broad and pointed. **Antirostrum:** Small and sharply rounded. **Excisura:** Moderate, notch shallow, angle wide.

***Parablennius pilicornis*, SSF No. 235.33 PLATE 126**

**DISTRIBUTION:** Western Mediterranean, Angola, South Africa from Knysna to Sodwana Bay, Brazil and Patagonia. Attains 12 cm SL.

**MATERIAL:** 5/7 (0.9-1.85 mm OD, 35-104 mm TL), PEM 5276 (RUSI 13846), 1106, 1105, 1104, 1103; off Durban and Bell Buoy, Algoa Bay; Id. IE, PCH.

**Otolith shape:** Oval-ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral flat. **Dorsal margin:** Rounded; **sculpture**, slightly irregular. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Sharply rounded and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, colliculi slightly raised. **Pseudocolliculum:** Absent. **Ostium:** Bulbous ventrally, with steep dorsal wall, opens

widely. **Cauda:** Flexed posteriorly, deeper at collum, poorly defined posteriorly. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1, 1:0.9, 1:0.9, 1:0.9, 1:1.1. **Collum:** Low. **Crista superior:** Well developed above ostium and collum, absent over cauda. **Crista inferior:** Well developed under collum, very poorly developed elsewhere. **Dorsal depression:** Absent. **Ventral depression:** Absent, may be a groove near margin. **Rostrum:** Short, broad and rounded or pointed. **Antirostrum:** Absent or very small and rounded. **Excisura:** Moderate, notch very shallow, angle wide.

***Pereulixia kosiensis*, SSF No. 235.34 PLATE 126**

**DISTRIBUTION:** Known from Durban north to Pakistan. Attains 20 cm SL.

**MATERIAL:** 3/5 (1.45-2.5 mm OD, 65-127 mm TL), 0924H, PEM 2681, 0791H; Botla Point and Cape Vidal; Id. MMS, TH.

**Otolith shape:** Oblong-ovate. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral flat or slightly concave. **Dorsal margin:** Slightly rounded; **sculpture**, slightly irregular. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Sharply rounded or blunt and slightly irregular. **Sulcus acusticus:** Ostial, becoming ostio-pseudocaudal, heterosulcoid. **Colliculum:** Heteromorph, very low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Flared, deeper at collum with steep dorsal wall. **Cauda:** Elongate, straight then flexed gently, ending close to ventral margin, poorly defined posteriorly. **Ostio-caudal differentiation:** Slightly dorsally constricted. **Ostium/cauda:** 1:1.1, 1:1.3, 1:1. **Collum:** Absent, step up to cauda. **Crista superior:** Well developed over ostium to mid-cauda, poorly developed posteriorly. **Crista inferior:** Poorly developed under ostium, well developed under neck and cauda. **Dorsal depression:** Oval. **Ventral depression:** Absent, may be a groove close to margin. **Rostrum:** Moderate, broad and sharply rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Moderately wide, notch shallow, angle wide.

***Plagiotremus tapeinosoma*, SSF No. 235.38 PLATE 126**

**DISTRIBUTION:** Widely distributed in Indo-Pacific, south to False Bay, Cape. Attains 12 cm SL.

**MATERIAL:** 3/5 (0.55-0.95 mm OD, 48-105 mm TL), PEM 2621, 0704H, 0460H; Durban, Sodwana and Bird Rock; Id. TH, PCH.

**Otolith shape:** Approximately discoid. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral convex. **Dorsal margin:** Slightly rounded; **sculpture**, slightly irregular. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Rounded and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, fused anterior and posterior colliculi, more pronounced with growth, indented along length. **Pseudocolliculum:** Absent. **Ostium:** Elongate, flared, deep in centre and colliculum raised around margin. **Cauda:** Straight, slightly flexed posteriorly, deep in centre with colliculum around edge. **Ostio-caudal differentiation:** Very slight dorsal constriction. **Ostium/cauda:** 1:1.3, 1:1.4, 1:1.1. **Collum:** Low in small otoliths (<0.85 mm OD). **Crista superior:** Ridge-like over ostium and neck, poorly developed posteriorly. **Crista inferior:** Well developed under neck, very poorly developed at extremes. **Dorsal depression:** Groove-like above crista. **Ventral depression:** Absent. **Rostrum:** Short, broad and rounded. **Antirostrum:** Short, broad and rounded, similar to rostrum. **Excisura:** Moderate, notch shallow, angle wide.

***Scartella emarginata*, SSF No. 235.40 PLATE 127**

**DISTRIBUTION:** Southern Angola to India. Attains 10 cm SL.

**MATERIAL:** 3/6 (0.95-1.38 mm OD, 55-71 mm TL), PEM 1102, 1098, 1101; off Durban; Id. IE.



**Otolith shape:** Oval-ovate. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral slightly concave. **Dorsal margin:** Rounded; **sculpture,** slightly irregular. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Sharply rounded and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, very low anterior colliculum, reduced posterior colliculum on ventral wall. **Pseudocolliculum:** Absent. **Ostium:** Flared, moderately deep. **Cauda:** Flexed, deep at collum and poorly developed posteriorly. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:1.2, 1:1.1, 1:1.7. **Collum:** Low. **Crista superior:** Well developed over ostium, poorly developed or absent over cauda. **Crista inferior:** Well developed below collum, poorly developed elsewhere. **Dorsal depression:** Absent. **Ventral depression:** Absent, groove close to margin. **Rostrum:** Short, broad and rounded or sharply rounded. **Antirostrum:** Small and rounded. **Excisura:** Moderate, notch shallow, angle wide.

#### *Xiphasia setifer*, SSF No. 235.42 PLATE 127

**DISTRIBUTION:** Red Sea and Indian Ocean to Japan and New Hebrides; south to False Bay. Attains 53 cm SL.

**MATERIAL:** 3/3 (0.55-1.0 mm OD, 255-455 mm TL), PEM 8294, 0475 (RUSI 04413), 14655; Cape west coast, Schoenmakerskop and Ledsman Shoal; Id. MJS, PCH.

**Otolith shape:** Oval-ovate. **Thickness:** Moderate. **Form:** - Mesial flat or slightly convex, - Lateral convex. **Dorsal margin:** Well rounded; **sculpture,** crenate or irregular. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Rounded, crenate or slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, indented colliculi. **Pseudocolliculum:** Absent. **Ostium:** Flared, deeper towards collum. **Cauda:** Narrow, deep and poorly developed posteriorly. **Ostio-caudal differentiation:** Very slight ventral constriction. **Ostium/cauda:** 1:0.8, 1:1.3, 1:1.3. **Collum:** Distinct, narrow. **Crista superior:** Absent along entire sulcus. **Crista inferior:** Very poorly developed under ostium, poorly developed under cauda. **Dorsal depression:** Shallow and oval. **Ventral depression:** Absent. **Rostrum:** Short, broad and rounded. **Antirostrum:** Absent or very short, broad and rounded. **Excisura:** Moderately wide, notch very shallow, angle wide.

#### AMMODYTIDAE Nelson No. 398

**Family characteristics:** One species described. Otoliths oblong-ovate, to at least 1.6 mm OD. Heterosulcoid, shallow straight sulcus, with ostial opening. Heteromorph with indistinct colliculi.

#### *Gymnammodytes capensis*, SSF No. 238.2 PLATE 127

**DISTRIBUTION:** Angola to Delagoa Bay, common on Cape south coast. Attains 17 cm.

**MATERIAL:** 1/2 (1.55 mm OD, 67 mm TL), PEM 0197; M'Bashee mouth; Id. MMS.

**Otolith shape:** Oblong-ovate. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral slightly convex. **Dorsal margin:** Slightly rounded; **sculpture,** slightly irregular. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Blunt, oblique and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Elongate, shallow, slightly flared and margins poorly defined. **Cauda:** Poorly defined, elongate, very shallow, straight and narrow. **Ostio-caudal differentiation:** Slightly ventrally constricted. **Ostium/cauda:** 1:0.9. **Collum:** Absent. **Crista superior:** Low ridge from ostium to mid-cauda, absent at tip. **Crista inferior:** Very poorly developed or absent along entire sulcus. **Dorsal depression:** Very shallow, covering most of dorsal area. **Ventral depression:** Absent. **Rostrum:** Moderate, broad and sharply rounded. **Antirostrum:** Small

and sharply rounded. **Excisura:** Moderate, notch shallow, angle wide.

#### CALLIONYMIDAE Nelson No. 399

**Family characteristics:** Three species described. Otoliths similar to *Bembrops* spp. (Percophidae). Otoliths moderately small, up to at least 5 mm OD. Rounded-triangular, heterosulcoid with ostial opening. Ostium elongate and narrow, cauda short and oval, filled with colliculum. Heteromorph colliculi, anterior indistinct, posterior usually fills cauda.

##### Key

- 1a. Otoliths elongate, rounded-triangular; rostrum very short and tapered . . . *Callionymus filamentosus* 239.1
- 1b. Otolith approximately rounded-ovate to triangular, rostrum tapered but longer than *C. filamentosus* . . . . . 2
- 2a. Postero-ventral corner of otolith sharply rounded; crista superior well developed over anterior ostium, ridge-like over mid-ostium to caudal tip . . . . . *Paracallionymus costatus* 239.6
- 2b. Postero-ventral corner of otolith oblique and pointed; crista superior ridge-like from ostium to cauda. . . . . *Synchiropus monacanthus* 239.8

#### *Callionymus filamentosus*, SSF No. 239.1 PLATE 127

**DISTRIBUTION:** Delagoa Bay northwards to Red Sea and Indo-West Pacific. Attains 20 cm.

**MATERIAL:** 1/1 (2.0 mm OD, 91 mm TL), PEM 15443 (RUSI 40561); Madagascar or possibly Bazaruto; Id. MJS, PCH.

**Otolith shape:** Elongate, rounded-triangular. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral approximately flat. **Dorsal margin:** Rounded; **sculpture,** slightly irregular. **Ventral margin:** Flat, slightly irregular. **Posterior margin:** Tapered, sharply rounded and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, indistinct anterior, posterior fills cauda. **Pseudocolliculum:** Absent. **Ostium:** Elongate, narrow, slightly flared anteriorly. **Cauda:** Short, rounded and filled with colliculum. **Ostio-caudal differentiation:** Slight dorso-ventral constrictions. **Ostium/cauda:** 1:0.3. **Collum:** Absent. **Crista superior:** Moderately well developed along ostium, ridge-like over cauda. **Crista inferior:** Moderately well developed along entire length of sulcus. **Dorsal depression:** Oval, above cauda. **Ventral depression:** Absent, groove close to margin and posterior groove behind cauda to margin. **Rostrum:** Very short, tapered, pointed. **Antirostrum:** Minute and rounded. **Excisura:** Moderate, notch extremely shallow, angle wide.

#### *Paracallionymus costatus*, SSF No. 239.6 PLATE 127

**DISTRIBUTION:** Endemic to southern Africa between Luderitz Bay and Inhaca Is. Attains 15 cm.

**MATERIAL:** 6/56 (1.5-3.05 mm OD, 34-150 mm SL), PEM 7236, 3190 (RUSI 12175), 7341, 12547 (RUSI 28463), 14142 (RUSI 28463), 12131; off Cape coast; Id. MJS, PCH.

**Otolith shape:** Approximately rounded-ovate to triangular. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral slightly convex. **Dorsal margin:** Raised posteriorly; **sculpture,** lobed. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Sharply rounded and lobed or irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low anterior colliculum, cauda filled with posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Elongate, deep, slightly flared anteriorly. **Cauda:** Short, rounded, filled with colliculum. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:0.6, 1:0.4, 1:0.4, 1:0.3, 1:0.6, 1:0.4. **Collum:** Absent. **Crista superior:** Well developed over anterior ostium, ridge-like over posterior ostium and cauda. **Crista inferior:** Mod-



erately well developed. **Dorsal depression:** Oval and deep, undercuts crista superior. **Ventral depression:** Absent, groove near margin from ostium to cauda. **Rostrum:** Moderate, pointed and may be upturned at tip. **Antirostrum:** Short or moderate, broad and sharply rounded. **Excisura:** Moderate, notch shallow, angle wide.

*Synchiropus monacanthus*, SSF No. 239.8 PLATE 127

**DISTRIBUTION:** Port Alfred northwards to Zanzibar. Attains 15 cm.

**MATERIAL:** 4/4 (3.2-5.0 mm OD, 109-185 mm TL), PEM 13038 (RUSI 28462), 12914 (RUSI 28462), 13004 (RUSI 28462), 13063; Mozambique; Id. MJS, PCH.

**Otolith shape:** Approximately triangular. **Thickness:** Moderate. **Form:** - Mesial flat, - Lateral slightly convex. **Dorsal margin:** Raised; **sculpture**, lobed and irregular. **Ventral margin:** Very slightly rounded and slightly irregular. **Posterior margin:** Pointed, oblique, lobed and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior indistinct, posterior colliculum may fill cauda. **Pseudocolliculum:** Absent. **Ostium:** Narrow and elongate, undercuts dorsal area anteriorly. **Cauda:** Short and rounded, may be filled with colliculum. **Ostio-caudal differentiation:** Very slight dorso-ventral constrictions. **Ostium/cauda:** 1:0.4, 1:0.3, 1:0.3, 1:0.4. **Collum:** Absent. **Crista superior:** Ridge-like along entire sulcus, anterior low, distinct posteriorly. **Crista inferior:** Poor or absent under anterior ostium, well developed below cauda. **Dorsal depression:** Large and deep, covers most of dorsal area. **Ventral depression:** Elongate, joined by ventral groove. **Rostrum:** Elongate, narrow and pointed. **Antirostrum:** Small and sharply rounded or rounded. **Excisura:** Moderately wide, notch shallow, angle acute.

ELEOTRIDIDAE Nelson No. 402

**Family characteristics:** One species described. Otoliths similar to Gobiidae. Approximately rhomboidal to square, up to at least 4.8 mm OD. Archaesulcoid with mesial opening. Homomorph with low colliculum.

*Eleotris fusca*, SSF No. 241.4 PLATE 128

**DISTRIBUTION:** Tropical Indo-West Pacific, south to Coffee Bay, Transkei. Attains 26 cm.

**MATERIAL:** 2/3 (3.9, 4.75 mm OD, 153, 200 mm TL), PEM 0303 (RUSI 04337), 15486 (RUSI 40625); Pumula, Natal and Swartkops; Id. MJS, GJBR.

**Otolith shape:** Approximately rhomboidal to square. **Thickness:** Moderate. **Form:** - Mesial flat, - Lateral flat. **Dorsal margin:** Flat; **sculpture**, serrate and irregular. **Ventral margin:** Flat and irregular. **Posterior margin:** Flat or irregular. **Sulcus acusticus:** Mesial, archaesulcoid. **Colliculum:** Homomorph, single, undifferentiated colliculum. **Pseudocolliculum:** Absent. **Ostium and cauda:** Undifferentiated, approximately oblong. **Ostio-caudal differentiation:** No constrictions. **Collum:** Absent. **Crista superior:** Very low ridge in mid-sulcus, very poorly developed at extremes. **Crista inferior:** Poorly developed along entire sulcus, slightly indented under posterior sulcus. **Dorsal depression:** Oval. **Ventral depression:** Absent, elongate and wide, shallow groove close to margin. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

GOBIIDAE Nelson No. 403

**Family characteristics:** Sixteen species described. Otolith shape varies; square, rhomboidal, tall or rectangular, up to c. 6 mm OD. Characteristic of this family is the indented sulcus which appears stamped with footprint or oblong shaped depression. Sulcus heterosulcoid or archaesulcoid with mesial opening. Ostium usually arrowhead shaped but may be slightly bifid and lobed, cauda

usually oblong with rounded or blunt tip. Homomorph or heteromorph, may be fused colliculi. Colliculi may be difficult to distinguish. Pseudocolliculum present, usually ventrally in neck area. Cristae usually well developed, superior may be a low ridge. Dorsal depression present, shallow and large. Ventral area may have one or two depressions, separated by a low ridge. Otoliths similar to Eleotridae.

Key

- 1a. Sulcus archaesulcoid and oval shaped; cristae developed as low ridges . . . . . *Priolepis cincta* 240.84
- 1b. Sulcus footprint shaped, may be slightly bifid; cristae usually poorly or well developed . . . . . 2
- 2a. Otoliths tall (rectangular or oval) . . . . . 3
- 2b. Otolith not tall (rectangular, square or rhomboidal shaped) . . . . . 5
- 3a. Dorsal depression oval to circular and distinct; two ventral depressions present, separated by low crescentic ridge . . . . . *Oxyurichthys papuensis* 240.71
- 3b. Dorsal depression shallow, elongate and oval; double ventral depression absent . . . . . 4
- 4a. Ostium slightly bifid; dorsal margin of otolith crenate; pseudocolliculum present dorsally in neck . . . . . *Gobiodon citrinus* 240.47
- 4b. Ostium oval with narrow papilla; dorsal margin of otolith rounded and slightly irregular; pseudocolliculum elongate under cauda . . . . . *Nemateleotris magnifica* 240.64
- 5a. Otolith approximately rhomboidal; postero-dorsal and antero-ventral corners pointed and protruding; dorsal margin of otolith approximately flat . . . . . 6
- 5b. Otolith not distinctly rhomboidal; postero-dorsal and antero-ventral corners not protruding but may be lobed and distinct; dorsal margin of otolith may be raised . . . . . 7
- 6a. Sulcus short and broad; ostium with bifid lobes . . . . . *Caffrogobius multifasciatus* 240.21
- 6b. Sulcus more elongate, footprint-shaped; ostium slightly bifid: *Caffrogobius agulhensis* 240.19, *C. caffer* 240.20, *C. nudiceps* 240.23, *C. saldanha* 240.24
- 7a. Postero-dorsal corner of otolith not lobed . . . . . 8
- 7b. Postero-dorsal corner of otolith lobed . . . . . 9
- 8a. Otolith rectangular; dorsal depression distinct, large and moderately deep; dorsal margin of otolith slightly rounded; sulcus more elongate and angled antero-ventrally . . . . . *Glossogobius callidus* 240.43
- 8b. Otolith shape varies - rounded square; dorsal depression very shallow, covers most of area; dorsal margin of otolith raised or rounded, lobed or irregular; sulcus short, broad and horizontal . . . . . *Sufflogobius bibarbatus* 240.97
- 9a. Otolith rectangular to wedge shaped with dorsal margin of otolith oblique; posterior margin of cauda poorly defined . . . . . *Istigobius ornatus* 240.57
- 9b. Otolith approximately square, rounded rectangular, pentagonal or rounded square; posterior margin of cauda rounded or blunt . . . . . 10
- 10a. Sulcus dumbbell shaped with bulging anterior and posterior tips . . . . . *Istigobius decoratus* 240.56
- 10b. Sulcus footprint shaped or arrow-like . . . . . 11
- 11a. Posterior margin of cauda rectangular and blunt; ostium arrowhead shaped; dorsal margin of otolith crenate; posterior margin notched . . . . . *Parachaeturichthys polynema* 240.73



- 11b. Posterior margin of cauda rounded; ostium slightly bifid or arrowhead shaped, dorsal margin serrate or lobed; posterior margin indented or emarginate . . . . 12
- 12a. Sulcus angled antero-ventrally; cauda moderately elongate; dorsal margin of otolith lobed . . . . .  
*Psammogobius knysnaensis* 240.87
- 12b. Sulcus horizontal; cauda short, bulging slightly at tip; dorsal margin of otolith serrate. . . . .  
*Yongeichthys nebulosus* 240.107

***Caffrogobius agulhensis*, SSF No. 240.19 PLATE 128**

**DISTRIBUTION:** East London to False Bay. Attains 7.5 cm.

**MATERIAL:** 4/6 (1.1-2.2 mm OD, 30-68 mm TL), PEM 4690, 4691, 6063, 6061; Cape south coast; Id. PCH.

**Otolith shape:** Approximately square, becoming more rectangular (>1.7 mm OD). **Thickness:** Moderate. **Form:** - Mesial convex, or flat, - Lateral convex. **Dorsal margin:** Slightly rounded; sculpture, slightly irregular. **Ventral margin:** Flat and slightly irregular. **Posterior margin:** Notched and protruding dorsally. **Sulcus acusticus:** Mesial, heterosulcoid. **Colliculum:** Homomorph, fused and indented colliculum. **Pseudocolliculum:** Present in the neck. **Ostium:** Broad and oval to arrowhead shaped. **Cauda:** Narrow and oval giving sulcus a footprint shape. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:1, 1:0.9, 1:1.4, 1:1.2. **Collum:** Absent. **Crista superior:** Well developed in neck and caudal region, poorly developed at extremes. **Crista inferior:** Poorly developed along entire sulcus, ventral area raised. **Dorsal depression:** Oval and shallow. **Ventral depression:** Absent, area below sulcus raised, a broad, shallow, crescent-shape groove present close to margin. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

***Caffrogobius caffer*, SSF No. 240.20 PLATE 128**

**DISTRIBUTION:** Natal to False Bay. Attains 18 cm.

**MATERIAL:** 2/7 (2.4, 2.7 mm OD, 75, 86 mm TL), PEM 5331, 5294; Algoa Bay and near Cape Recife; Id. LEB, MJS.

**Otolith shape:** Rhomboidal. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral slightly convex. **Dorsal margin:** Slightly rounded; sculpture, irregular. **Ventral margin:** Flat and irregular. **Posterior margin:** Notched centrally and protruding postero-dorsally, irregular. **Sulcus acusticus:** Mesial, heterosulcoid. **Colliculum:** Homomorph, single low, depressed colliculum. **Pseudocolliculum:** Present in the neck. **Ostium:** Approximately oval to arrowhead shaped. **Cauda:** Approximately oval giving sulcus a footprint shape. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:1, 1:1.4. **Collum:** Absent. **Crista superior:** Poorly developed along entire sulcus. **Crista inferior:** Poorly developed along entire sulcus, area below raised. **Dorsal depression:** Oval and shallow covering most of dorsal area. **Ventral depression:** Absent, area below sulcus raised, a broad, shallow, crescent shaped groove present close to margin. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

***Caffrogobius multifasciatus*, SSF No. 240.21  
PLATE 128**

**DISTRIBUTION:** Mozambique to Table Bay. Attains 15 cm.

**MATERIAL:** 4/5 (1.5-4.65 mm OD, 40-126 mm TL), 1418H, 1417H, 1416H, PEM 1478; Swartvlei estuary, Fish River estuary; Id. HMK, OG.

**Otolith shape:** Approximately square. **Thickness:** Moderate. **Form:** - Mesial slightly convex or flat, - Lateral convex. **Dorsal margin:** Slightly rounded; sculpture, slightly irregular. **Ventral margin:** Flat and slightly irregular. **Posterior margin:** Notched and pointed, protruding postero-dorsal corner. **Sulcus acusticus:**

Mesial, heterosulcoid. **Colliculum:** Homomorph, fused and very slightly raised. **Pseudocolliculum:** Present in the neck. **Ostium:** Bifid and flared. **Cauda:** Approximately oval giving a footprint shape to sulcus. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:1.1, 1:0.9, 1:1.1, 1478 eroded. **Collum:** Absent. **Crista superior:** Well developed in neck region, poorly developed at extremes. **Crista inferior:** Very poorly developed along entire sulcus, area below raised. **Dorsal depression:** Oval, shallow and large. **Ventral depression:** Absent, area below sulcus raised, a broad, shallow, crescent shaped groove present close to margin. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

***Caffrogobius nudiceps*, SSF No. 240.23 PLATE 128**

**DISTRIBUTION:** East London to Cape and north to Walvis Bay. Attains 14 cm.

**MATERIAL:** 4/30 (1.4-4.15 mm OD, 36-95 mm TL, 0073 not measured), PEM 4043, 4050, 4062, 0073; Swartkops and near Cape Recife; Id. GJBR, MJS, LEB.

**Otolith shape:** Approximately square. **Thickness:** Moderately thin. **Form:** - Mesial flat, - Lateral slightly convex. **Dorsal margin:** Slightly flat or rounded; sculpture, slightly irregular or irregular. **Ventral margin:** Flat and slightly irregular or irregular. **Posterior margin:** Notched and protruding postero-dorsally. **Sulcus acusticus:** Mesial, heterosulcoid. **Colliculum:** Homomorph, fused very low, indented colliculum. **Pseudocolliculum:** Present in the neck. **Ostium:** Flared and bifid. **Cauda:** Approximately round giving a footprint shape. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:1.1, 1:1.2, 1:1.3, 1:1. **Collum:** Absent. **Crista superior:** Well developed in neck region, poorly developed at extremes. **Crista inferior:** Well developed along entire sulcus, area below raised. **Dorsal depression:** Oval, shallow and large. **Ventral depression:** Absent, area below sulcus raised, a broad, shallow, crescent shaped groove present close to margin, less distinct in large otoliths (c. 4 mm OD). **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

***Caffrogobius saldanha*, SSF No. 240.24 PLATE 128**

**DISTRIBUTION:** Saldanha Bay to southern Transkei. Attains 12 cm.

**MATERIAL:** 3/17 (2.2-3.4 mm OD, 75-87 mm TL), PEM 10468, 10005, 10004; Chelsea Point to Schoenmakerskop; Id. MJS, D.F. Hoese.

**Otolith shape:** Approximately square. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral convex. **Dorsal margin:** Slightly rounded; sculpture, slightly irregular. **Ventral margin:** Flat and slightly irregular. **Posterior margin:** Rounded and notched, protruding postero-dorsally. **Sulcus acusticus:** Mesial, heterosulcoid. **Colliculum:** Homomorph, low, indented, fused and irregular colliculum. **Pseudocolliculum:** Present in the neck. **Ostium:** Approximately arrowhead shaped. **Cauda:** Narrow and elongate, may be flared at tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1, 1:1, 1:1.1. **Collum:** Absent. **Crista superior:** Well developed along entire sulcus. **Crista inferior:** Well developed along entire sulcus, area below raised. **Dorsal depression:** Oval and moderately deep. **Ventral depression:** Absent, area below sulcus raised, a broad, shallow, crescent shaped groove present close to margin. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

***Glossogobius callidus*, SSF No. 240.43 PLATE 129**

**DISTRIBUTION:** Aldabra, Mozambique, south to Port Elizabeth. Attains 12 cm.

**MATERIAL:** 1/1 (2.75 mm OD, 96 mm TL), 0793H; Lake Sibaya; Id. M. Bruton.



**Otolith shape:** Rectangular. **Thickness:** Moderate. **Form:** - **Mesial** slightly convex or flat, - **Lateral** convex. **Dorsal margin:** Slightly rounded; **sculpture**, slightly irregular. **Ventral margin:** Flat and slightly irregular. **Posterior margin:** Emarginate. **Sulcus acusticus:** Mesial, heterosulcoid. **Colliculum:** Heteromorph, low anterior and posterior colliculi. **Pseudocolliculum:** Present in the neck. **Ostium:** Approximately oval to arrowhead shaped. **Cauda:** Approximately oval and small, sulcus angled antero-ventrally. **Ostio-caudal differentiation:** Dorsally constricted. **Ostium/cauda:** 1:1.1. **Collum:** Absent. **Crista superior:** Ridge-like from posterior ostium to caudal tip, poorly developed at anterior. **Crista inferior:** Poorly developed along entire sulcus, area below raised. **Dorsal depression:** Oval and deep, covering most of area. **Ventral depression:** Absent, area below sulcus raised, a broad, shallow, crescent shaped groove present close to margin. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

***Gobiodon citrinus*, SSF No. 240.47 PLATE 129**

**DISTRIBUTION:** Indo-West Pacific, south to Delagoa Bay. Attains 6 cm.

**MATERIAL:** 2/2 (1.5, 1.65 mm OD, 40, 42 mm TL), 1039H, 0994H; Eilat; Id. TH, AD.

**Otolith shape:** Rectangular and tall. **Thickness:** Medium thick. **Form:** - **Mesial** approximately flat, - **Lateral** convex. **Dorsal margin:** Rounded; **sculpture**, crenate or slightly irregular. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Straight and slightly emarginate, slightly irregular. **Sulcus acusticus:** Mesial, heterosulcoid. **Colliculum:** Homomorph, single low colliculum. **Pseudocolliculum:** Present dorsally in the neck. **Ostium:** Approximately oval. **Cauda:** Approximately round, sulcus angled antero-ventrally. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:0.8, 0994H eroded. **Collum:** Absent. **Crista superior:** Very poorly developed along entire sulcus. **Crista inferior:** Poorly developed along entire sulcus, area below raised. **Dorsal depression:** Oval and shallow. **Ventral depression:** Absent, area below sulcus raised, a broad, shallow, crescent shaped groove present close to margin. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

***Istigobius decoratus*, SSF No. 240.56 PLATE 129**

**DISTRIBUTION:** Indo-West Pacific south to Durban. Attains 13 cm.

**MATERIAL:** 1/1 (4.4 mm OD, 129 mm TL), PEM 6742 (RUSI 28464); ORI; Id. PCH.

**Otolith shape:** Approximately square. **Thickness:** Moderate. **Form:** - **Mesial** convex, - **Lateral** slightly concave. **Dorsal margin:** Slightly rounded, postero-dorsal corner rounded and raised; **sculpture**, slightly irregular. **Ventral margin:** Approximately flat and slightly irregular. **Posterior margin:** Flat, lobe protrudes postero-dorsally. **Sulcus acusticus:** Mesial, heterosulcoid. **Colliculum:** Homomorph, low and dumbbell shaped. **Pseudocolliculum:** Present in the neck. **Ostium:** Approximately oval to arrowhead shaped. **Cauda:** Approximately round. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.2. **Collum:** Absent. **Crista superior:** Low, rounded ridge along entire sulcus. **Crista inferior:** Poorly developed along entire sulcus, area below raised. **Dorsal depression:** Oval and shallow. **Ventral depression:** Absent, area below sulcus raised, a broad, shallow, crescent shaped groove present close to margin. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

***Istigobius ornatus*, SSF No. 240.57 PLATE 129**

**DISTRIBUTION:** Indo-West Pacific. Attains at least 9.3 cm.

**MATERIAL:** 1/1 (3.15 mm OD, 93 mm TL), PEM 4355; Durban Bay; Id. PCH.

**Otolith shape:** Approximately rectangular to wedge shaped. **Thickness:** Moderate. **Form:** - **Mesial** convex, - **Lateral** concave. **Dorsal margin:** Oblique, lobe raised posteriorly; **sculpture**, irregular. **Ventral margin:** Flat and slightly irregular. **Posterior margin:** Flat, postero-dorsally flared and irregular. **Sulcus acusticus:** Mesial, heterosulcoid. **Colliculum:** Homomorph, colliculum fused. **Pseudocolliculum:** Present in the neck. **Ostium:** Approximately oval to arrowhead shaped. **Cauda:** Approximately rounded, posterior wall poorly defined, sulcus horizontal. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.2. **Collum:** Absent. **Crista superior:** Well developed from mid-ostium to mid-cauda, poorly developed at extremes, may be absent in posterior. **Crista inferior:** Poorly developed along entire sulcus, area below raised. **Dorsal depression:** Oval and shallow. **Ventral depression:** Absent, area below sulcus raised, a broad, shallow, crescent shaped groove present close to margin. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

***Nemateleotris magnifica*, SSF No. 240.64 PLATE 129**

**DISTRIBUTION:** From Sodwana Bay and Comoro Ids to Marquesas Is. in Pacific. Attains 9 cm.

**MATERIAL:** 1/1 (1.8 mm OD, 74 mm TL), PEM 2868; Sodwana; Id. GJBR.

**Otolith shape:** Rectangular to tall. **Thickness:** Moderate. **Form:** - **Mesial** flat, - **Lateral** slightly convex. **Dorsal margin:** Rounded; **sculpture**, slightly irregular. **Ventral margin:** Flat and approximately entire. **Posterior margin:** Straight, slightly emarginate and slightly irregular. **Sulcus acusticus:** Mesial, heterosulcoid. **Colliculum:** Homomorph. **Pseudocolliculum:** Present from neck to cauda. **Ostium:** Approximately oval and slightly bifid with small upper lobe. **Cauda:** Approximately rounded, posterior margin indistinct. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:0.6. **Collum:** Absent. **Crista superior:** Very poorly developed along entire length of sulcus, poor to absent at posterior. **Crista inferior:** Poorly developed along entire sulcus, area below raised. **Dorsal depression:** Oval and indistinct. **Ventral depression:** Absent, area below sulcus raised, a broad, shallow, crescent shaped groove present close to margin. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

***Oxyurichthys papuensis*, SSF No. 240.71 PLATE 129**

**DISTRIBUTION:** Indo-West Pacific, south to Delagoa Bay. Attains 18 cm.

**MATERIAL:** 1/1 (5.74 mm OD, 195 mm TL), PEM 15446 (RUSI 40564); either Madagascar or Bazaruto; Id. PCH.

**Otolith shape:** Tall and oval. **Thickness:** Moderate. **Form:** - **Mesial** slightly convex, - **Lateral** slightly concave. **Dorsal margin:** Raised and rounded; **sculpture**, irregular. **Ventral margin:** Slightly rounded and irregular. **Posterior margin:** Straight, notched, lobed and irregular. **Sulcus acusticus:** Mesial, heterosulcoid. **Colliculum:** Heteromorph, indented, anterior colliculum bifid, posterior circular. **Pseudocolliculum:** Absent. **Ostium:** Slightly bifid and lobed. **Cauda:** Approximately oval with rounded tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:0.9. **Collum:** Absent. **Crista superior:** Poorly developed, may be low ridge in neck. **Crista inferior:** Ridge-like from mid-ostium to mid-cauda, poorly developed at extremes. **Dorsal depression:** Distinct and oval. **Ventral depression:** Two crescentic depressions separated by a crescentic ridge. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.



**DISTRIBUTION:** Indo-West Pacific, to Natal. Attains 15 cm.

**MATERIAL:** 1/1 (4.8 mm OD, 115 mm TL), PEM 0229; Tugela mouth; Id. GJBR.

**Otolith shape:** Approximately rounded-rectangular. **Thickness:** Moderate. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Rounded, oblique; **sculpture**, crenate. **Ventral margin:** Flat and slightly irregular. **Posterior margin:** Rounded, notched and lobed. **Sulcus acusticus:** Mesial, heterosulcoid. **Colliculum:** Homomorph, very low colliculum. **Pseudocolliculum:** Present in the neck. **Ostium:** Approximately oval to arrowhead shaped, depressed in centre. **Cauda:** Approximately rectangular, caudal tip blunt, poorly defined. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.1. **Collum:** Absent. **Crista superior:** Well developed in neck region, well rounded and raised from mid-ostium and over cauda, poorly developed over anterior ostium. **Crista inferior:** Very poorly developed along entire sulcus, area below raised. **Dorsal depression:** Oval and deep. **Ventral depression:** Shallow groove-like, area below this raised, and a broad, elongate, shallow groove present near margin. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

*Priolepis cincta*, SSF No. 240.84 PLATE 129

**DISTRIBUTION:** Indo-West Pacific, to Natal. Attains 6 cm.

**MATERIAL:** 1/1 (1.95 mm OD, 49 mm TL), PEM 4356; Durban; Id. PCH.

**Otolith shape:** Approximately square. **Thickness:** Moderate. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Slightly rounded; **sculpture**, approximately entire. **Ventral margin:** Approximately flat and slightly irregular. **Posterior margin:** Notched and protruding postero-dorsally, slightly irregular. **Sulcus acusticus:** Mesial, archaesusulcoid. **Colliculum:** Homomorph, single low colliculum. **Pseudocolliculum:** Absent. **Ostium** and **cauda:** Undifferentiated, sulcus oval, angled slightly antero-ventrally. **Ostio-caudal differentiation:** No constrictions. **Collum:** Absent. **Crista superior:** Well developed or low ridge along entire sulcus. **Crista inferior:** Poorly developed along entire sulcus, area below posterior part is raised. **Dorsal depression:** Elongate, joins ventral groove. **Ventral depression:** Absent, narrow area raised, a broad, shallow, crescent shaped groove close to margin. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

*Psamogobius knysnaensis*, SSF No. 240.87

PLATE 129

**DISTRIBUTION:** Known from Port Nolloth to Natal. Attains 7 cm.

**MATERIAL:** 3/6 (1.6-2.45 mm OD, c. 50-101 mm TL), 1413H, 1411H, 0218H; Swartkops and Fish River; Id. TH, OG.

**Otolith shape:** Approximately rounded square, varies with growth. **Thickness:** Moderately thick. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Slightly rounded; **sculpture**, lobed or slightly irregular. **Ventral margin:** Flat or slightly rounded and slightly irregular. **Posterior margin:** Indented and lobed. **Sulcus acusticus:** Mesial, heterosulcoid. **Colliculum:** Homomorph, fused colliculum. **Pseudocolliculum:** Present from neck to anterior cauda. **Ostium:** Approximately arrowhead shaped, indented antero-dorsally and shallow. **Cauda:** Oblong. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:1.2, 1:1.6, 1:1.1. **Collum:** Absent. **Crista superior:** Low ridge over mid-sulcus, well developed elsewhere. **Crista inferior:** Moderately well developed along entire sulcus, area below raised. **Dorsal depression:** Oval and shallow. **Ventral depression:** Absent, area below sulcus raised, a

broad, shallow, crescent shaped groove present close to margin. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

*Sufflogobius bibarbatus*, SSF No. 240.97 PLATE 129

**DISTRIBUTION:** Shoals between Port Nolloth and Saldanha Bay. Attains 13 cm.

**MATERIAL:** 4/85 (1.9-4.2 mm OD, 72-159 mm TL), PEM 14679, 7794 (RUSI 28466), 10957, 14674; Cape west coast and Namibia; Id. PAH, PCH, MJS.

**Otolith shape:** Varied, approximately square or rounded. **Thickness:** Moderately thick. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Rounded or raised; **sculpture**, lobed or irregular. **Ventral margin:** Flat or slightly rounded and approximately entire. **Posterior margin:** Rounded or flat, may be notched and approximately entire. **Sulcus acusticus:** Mesial, heterosulcoid. **Colliculum:** Homomorph. **Pseudocolliculum:** Present in small otoliths (c. 2.8 mm OD) but indistinct. **Ostium:** Approximately arrowhead shaped. **Cauda:** Approximately oval. **Ostio-caudal differentiation:** Slightly ventrally constricted. **Ostium/cauda:** 1:1, 1:0.8, 1:0.8, 1:0.8. **Collum:** Absent. **Crista superior:** Well developed becoming low ridge, poorly developed at extremes. **Crista inferior:** Poorly developed along entire sulcus, area below raised. **Dorsal depression:** Oval and shallow, covers most of area. **Ventral depression:** Absent, area below sulcus raised, a broad, shallow, crescent shaped groove present close to margin. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

*Yongeichthys nebulosus*, SSF No. 240.107 PLATE 129

**DISTRIBUTION:** Widespread in western tropical Pacific and Indian Oceans, extending south to Durban. Attains 18 cm.

**MATERIAL:** 1/1 (5.12 mm OD, 107 mm TL), PEM 15445 (RUSI 40563); Madagascar or Bazaruto; Id. PCH.

**Otolith shape:** Approximately pentagonal. **Thickness:** Moderate. **Form:** - Mesial slightly convex or flat, - Lateral slightly concave or flat. **Lateral surface:** May have a papilla-like knob on lateral surface. **Dorsal margin:** Slightly rounded with raised lobe posteriorly; **sculpture**, serrate. **Ventral margin:** Approximately flat and slightly crenate. **Posterior margin:** Emarginate with protruding dorsal corner, slightly irregular. **Sulcus acusticus:** Mesial, heterosulcoid. **Colliculum:** Heteromorph, colliculi indented, anterior flared, posterior oval. **Pseudocolliculum:** Present below cauda. **Ostium:** Approximately oval to arrowhead shaped. **Cauda:** Oval. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.1. **Collum:** Absent. **Crista superior:** Moderately well developed along the entire sulcus, may be a low, broad ridge over neck. **Crista inferior:** Moderately well developed but poorly developed posteriorly. **Dorsal depression:** Oval and shallow. **Ventral depression:** Two shallow crescentic depressions separated by rounded raised area. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

ACANTHURIDAE Nelson No. 409

**Family characteristics:** Otoliths ovate, oblong or rounded-ovate, moderate in size up to at least 6.5 mm OD. Heterosulcoid with ostial openings. Ostium flared and oval, elongate in the genus *Naso*. Cauda usually short and sharply flexed with rounded tip, but may be gently flexed. Cristae usually well developed along most of sulcus, may be a low ridge over anterior cauda. Rostrum moderate to elongate.

**Key**

- 1a. Otolith rounded-ovate; ostium deep and very broad . . . . . 2
- 1b. Otolith ovate or oblong ovate; ostium elongate or short, not very broad . . . . . 3



- 2a. Dorsal and posterior margins of otolith rounded; ostium deep and cup-like; dorsal depression shallow . . . . . *Zebrasoma gemmatum* 243.17
- 2b. Dorsal margin of otolith rounded or raised; posterior margin angled and bluntly rounded or flattened; ostium moderately deep, not cup-like; dorsal depression distinct but shallow . . . . . *Zebrasoma scopas* 243.18
- 3a. Ostium very elongate, tapered strongly on dorsal and ventral margins; anterior cauda relatively short, sharply flexed tip; posterior margin of otolith oblique and straight . . . . . 4
- 3b. Ostium not elongate and narrow and not distinctly tapered on dorsal and ventral margins; cauda of similar size; posterior margin of otolith rounded blunt or emarginate . . . . . 6
- 4a. Caudal tip almost reaches ventral margin; posterior cauda after flexion elongate, straight and poorly defined; posterior margin of otolith approximately vertical . . . . . *Naso annulatus* 243.20
- 4b. Caudal tip does not reach ventral margin; posterior cauda after flexion not elongate; posterior margin oblique or rounded . . . . . 5
- 5a. Dorsal depression deep, extends from neck to flexion; antirostrum elongate; posterior cauda deep after flexion . . . . . *Naso brevirostris* 243.22
- 5b. Dorsal depression small above anterior cauda, not extending to flexion; antirostrum short; posterior cauda shallow after flexion . . . . . *Naso tuberosus* 243.29
- 6a. Ostium very short, flared; cauda roundly flexed and elongate; caudal tip almost reaches ventral margin; rostrum short, broad and rounded . . . . . 7
- 6b. Ostium moderate, not widely flared; caudal tip does not end close to margin; rostrum moderate or narrow . . . . . 8
- 7a. Rostrum very broad and rounded; ostium short and flared widely; postero-dorsal corner angled; sulcus with distinct ventral constriction . . . . . *Acanthurus triostegus* 243.11
- 7b. Rostrum moderately broad; ostium cup-like; postero-dorsal corner rounded; sulcus with curved ventral constriction . . . . . *Acanthurus tennentii* 243.9
8. Ostium moderate; cauda gently or sharply flexed with rounded tip. Several species which exhibit some intraspecific variation, consult photographs and reference material: *Acanthurus blochii* 243.1, *A. dussumieri* 243.2, *A. leucosternon* 243.3, *A. lineatus* 243.4, *A. nigrofasciatus* 243.7, *A. triostegus* 243.11, *A. xanthopterus* 243.12, *Ctenochaetus striatus* 243.14, *C. strigosus* 243.15, *Paracanthurus hepatus* 243.16, *Zebrasoma veliferum* 243.19.

#### ***Acanthurus blochii*, SSF No. 243.1 PLATE 130**

**DISTRIBUTION:** Indo-Pacific, south to Durban. Attains at least 42 cm.

**MATERIAL:** 1/1 (5.0 mm OD, 242 mm TL), PEM 15406 (RUSI 40613); Madagascar; Id. PCH.

**Otolith shape:** Ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded; **sculpture,** irregular. **Ventral margin:** Slightly rounded and slightly crenate. **Posterior margin:** Blunt, emarginate and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, colliculi low, anterior slightly depressed. **Pseudocolliculum:** Absent. **Ostium:** Moderately elongate, approximately oval. **Cauda:** Short, strongly flexed and flared at tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:**

1:1. **Collum:** Absent. **Crista superior:** Well developed along entire sulcus. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Absent, posterior depression behind flexion, posterior margin angled and depressed. **Ventral depression:** Absent. **Rostrum:** Short, moderately broad and sharply rounded. **Antirostrum:** Minute and sharply rounded. **Excisura:** Moderately wide, notch shallow, angle wide.

#### ***Acanthurus dussumieri*, SSF No. 243.2 PLATE 130**

**DISTRIBUTION:** Algoa Bay to western Pacific and Hawaiian Ids. Common on the Natal coast. Attains 54 cm.

**MATERIAL:** 3/5 (5.32-6.1 mm OD, 238-284 mm FL), PEM 2668, 15407 (RUSI 40612), 5995; Limestone Reef, Madagascar and Botla Point; Id. MJS, PCH.

**Otolith shape:** Ovate. **Thickness:** Moderate. **Form:** - Mesial strongly convex, - Lateral strongly concave. **Dorsal margin:** Slightly rounded, raised in mid-margin; **sculpture,** irregular. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Flat, emarginate and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low anterior and posterior colliculi. **Pseudocolliculum:** Absent. **Ostium:** Slightly flared and moderately wide. **Cauda:** Approximately straight and sharply flexed distally, tip short and rounded. **Ostio-caudal differentiation:** Slight dorso-ventral narrowing. **Ostium/cauda:** 1:1, 1:1.1, 1:1.2. **Collum:** Absent. **Crista superior:** Well developed along sulcus, but ridge-like over ostium to mid-cauda. **Crista inferior:** Poor under ostium, well developed to ridge-like along cauda. **Dorsal depression:** Oval and moderately deep. **Ventral depression:** Absent, posterior margin depressed. **Rostrum:** Moderate, broad and sharply rounded. **Antirostrum:** Small and pointed. **Excisura:** Moderately wide, notch shallow, angle varies.

#### ***Acanthurus leucosternon*, SSF No. 243.3 PLATE 130**

**DISTRIBUTION:** Sodwana Bay to Indonesia. Attains 23 cm.

**MATERIAL:** 4/16 (3.3-4.9 mm OD, 93-203 mm TL), PEM 6985, 6132 (RUSI 17178), 6453, 6452, [8796 (RUSI 37423)]; off Natal and PEO; Id. MJS, PCH.

**Otolith shape:** Ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded or flat; **sculpture,** crenate or irregular. **Ventral margin:** Rounded and irregular. **Posterior margin:** Flat, oblique or emarginate and irregular, may be digitate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low anterior and posterior colliculi. **Pseudocolliculum:** Absent. **Ostium:** Slightly flared, walls steep. **Cauda:** Short, moderately wide and strongly flexed, tip rounded. **Ostio-caudal differentiation:** Slight dorso-ventral narrowing. **Ostium/cauda:** 1:1, 1:1.1, 1:0.9, 1:0.9. **Collum:** Absent. **Crista superior:** Low, ridge-like from ostium to caudal flexion, well developed elsewhere. **Crista inferior:** Well developed but poor under anterior ostium. **Dorsal depression:** Indistinct and very shallow. **Ventral depression:** Absent. **Rostrum:** Short, broad and sharply rounded. **Antirostrum:** Small and pointed. **Excisura:** Moderately wide, notch shallow, angle wide.

#### ***Acanthurus lineatus*, SSF No. 243.4 PLATE 130**

**DISTRIBUTION:** Indo-Pacific south to Durban. Attains 38 cm.

**MATERIAL:** 5/12 (3.0-6.34 mm OD, c. 138-300 mm TL), PEM 0482, 2669, 15408 (RUSI 40611), 0732, 0731; Durban Bay, Madagascar and Botla Point; Id. MJS, PCH.

**Otolith shape:** Ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded; **sculpture,** crenate or irregular. **Ventral margin:** Rounded, crenate or irregular. **Posterior margin:** Flat, emarginate and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, very low anterior and posterior colliculi. **Pseudocolliculum:** Absent. **Ostium:** Slightly flared and elongate, dorsal



edge of rostrum may be raised. **Cauda:** Short and flexed, tip rounded, relatively shorter with growth (c. 5.6 mm OD). **Ostio-caudal differentiation:** Very slight dorso-ventral narrowing. **Ostium/cauda:** 1:1.1, 1:0.7, 1:1.2, 1:1.1, 1:0.8. **Collum:** Absent. **Crista superior:** Well developed along entire sulcus. **Crista inferior:** Well developed but poor under anterior ostium. **Dorsal depression:** Oval and very shallow. **Ventral depression:** Absent. **Rostrum:** Moderate, broad and rounded or sharply rounded. **Antirostrum:** Very small and rounded or sharply rounded. **Excisura:** Moderately wide, notch very shallow, angle wide.

***Acanthurus nigrofuscus*, SSF No. 243.7 PLATE 130**

**DISTRIBUTION:** Indo-Pacific to Coffee Bay, Transkei; common off Natal. Attains c. 20 cm.

**MATERIAL:** 5/16 (2.85-4.4 mm OD, 87-132 mm TL), PEM 2717, 2775, 8328 (RUSI 37432), 4414, 6689 (RUSI 28465); Ledsman Shoal, ORI and Sodwana; Id. MJS, PCH.

**Otolith shape:** Ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral slightly concave. **Dorsal margin:** Slightly rounded; **sculpture**, lobed or irregular. **Ventral margin:** Rounded and crenate or slightly irregular. **Posterior margin:** Flat, emarginate and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, very low anterior and posterior colliculi. **Pseudocolliculum:** Absent. **Ostium:** Slightly flared and wide. **Cauda:** Straight and flexed, tip rounded. **Ostio-caudal differentiation:** Slight dorso-ventral narrowing. **Ostium/cauda:** 1:1.2, 1:1, 1:1.2, 1:1.2, 4414 broken. **Collum:** Absent. **Crista superior:** Well developed along entire sulcus. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Oval and shallow. **Ventral depression:** Absent. **Rostrum:** Short, broad and pointed or sharply rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Moderately wide, notch very shallow, angle wide.

***Acanthurus tennenti*, SSF No. 243.9 PLATE 130**

**DISTRIBUTION:** Western Indian Ocean from Natal to Sri Lanka. Attains 31 cm.

**MATERIAL:** 1/1 (5.82 mm OD, 310 mm TL), PEM 2894; Sodwana; Id. GRA.

**Otolith shape:** Rounded-ovate. **Thickness:** Thick. **Form:** - Mesial very convex, - Lateral very concave. **Dorsal margin:** Rounded, raised; **sculpture**, irregular. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Flat and very irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low anterior colliculum in posterior ostium and low posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Anterior deep and rounded, cup-like and flared. **Cauda:** Approximately straight then flexed with steep walls, tip rounded, ending close to margin. **Ostio-caudal differentiation:** Slight dorso-ventral narrowing, more distinct dorsally. **Ostium/cauda:** 1:1. **Collum:** Absent. **Crista superior:** Well developed, poorly developed over caudal tip. **Crista inferior:** Well developed. **Dorsal depression:** Oval and deep. **Ventral depression:** Absent, area irregular. **Rostrum:** Short, very broad and rounded. **Antirostrum:** Very small, broad and sharply rounded. **Excisura:** Moderately wide, notch very shallow, angle wide.

***Acanthurus triostegus*, SSF No. 243.11 PLATE 131**

**DISTRIBUTION:** Throughout the Indo-Pacific (except Red Sea and Persian Gulf), south to the Bashee River; also in eastern Pacific. Attains 27 cm, usually up to 20 cm.

**MATERIAL:** 4/12 (2.0-3.35 mm OD, 67-161 mm TL), PEM 5433, 0608, 8642 (RUSI 37433), 2836, [6641 (RUSI 28469)]; Kosi Bay and near Cape Recife; Id. MJS, PCH.

**Otolith shape:** Rounded-ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly

rounded; **sculpture**, lobed or irregular. **Ventral margin:** Rounded and crenate or irregular. **Posterior margin:** Flat and emarginate, irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, very low anterior and posterior colliculi. **Pseudocolliculum:** Absent. **Ostium:** Short and flared widely. **Cauda:** Approximately straight, moderately wide and flexed, tip rounded. **Ostio-caudal differentiation:** Dorso-ventrally narrowed. **Ostium/cauda:** 1:1.1, 1:1.1, 1:1, 1:1.1. **Collum:** Absent. **Crista superior:** Low ridge over neck and anterior cauda, poorly developed over anterior ostium, moderately well developed at tip. **Crista inferior:** Well developed under entire sulcus. **Dorsal depression:** Oval and shallow. **Ventral depression:** Absent. **Rostrum:** Short, very broad and rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Moderately wide, notch shallow, angle wide.

***Acanthurus xanthopterus*, SSF No. 243.12 PLATE 131**

**DISTRIBUTION:** Durban to eastern Pacific. Attains 62.5 cm.

**MATERIAL:** 5/16 (4.35-8.5 mm OD, 181-537 mm TL), PEM 6648 (RUSI 28468), 14828 (RUSI 37087), 5997, 5909, 14862, [9616 (RUSI 37449), 14830 & 14831 (both RUSI 37087)]; PEO, Limestone Reef and Kosi Bay; Id. MJS, PCH.

**Otolith shape:** Ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded or rounded; **sculpture**, irregular. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Emarginate and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Elongate, slightly flared. **Cauda:** Long, straight then flexed, tip rounded ending near posterior margin. **Ostio-caudal differentiation:** Slightly narrowed dorso-ventrally. **Ostium/cauda:** 1:1.1, 1:1, 1:1.3, 1:1.2, 1:1.1. **Collum:** Absent. **Crista superior:** Well developed along entire sulcus. **Crista inferior:** Well developed but poor under anterior ostium. **Dorsal depression:** Oval and shallow. **Ventral depression:** Absent, may be groove near margin. **Rostrum:** Elongate, large and rounded. **Antirostrum:** Small or moderate and sharply rounded. **Excisura:** Moderately wide, notch shallow or deep, angle varied.

***Ctenochaetus striatus*, SSF No. 243.14 PLATE 131**

**DISTRIBUTION:** Indo-Pacific, south to Natal. Attains c. 26 cm.

**MATERIAL:** 3/12 (4.0-4.5 mm OD, 123-147 mm TL), PEM 14829 (RUSI 37091), 8326 (RUSI 37431), 14267, [8327 (RUSI 37434)]; Comoro Ids and Kosi Bay; Id. MJS, PCH.

**Otolith shape:** Ovate. **Thickness:** Moderate. **Form:** - Mesial moderately convex, - Lateral moderately concave. **Dorsal margin:** Slightly rounded; **sculpture**, crenate or irregular. **Ventral margin:** Rounded and angled, slightly irregular. **Posterior margin:** Flat, emarginate and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Elongate and oval. **Cauda:** Approximately straight and flexed at rounded tip. **Ostio-caudal differentiation:** Slight dorso-ventral narrowing. **Ostium/cauda:** 1:1, 1:1, 1:1.1. **Collum:** Absent. **Crista superior:** Well developed along entire sulcus. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Oval and shallow. **Ventral depression:** Absent. **Rostrum:** Moderately short, broad and sharply rounded. **Antirostrum:** Absent or small and rounded. **Excisura:** Moderately wide, notch very shallow, angle wide.

***Ctenochaetus strigosus*, SSF No. 243.15 PLATE 131**

**DISTRIBUTION:** Indo-Pacific, south to Natal. Attains 18 cm.

**MATERIAL:** 2/2 (4.9, 5.0 mm OD, 140, 180 mm TL), PEM 14268, 14563 (RUSI 31404); Mauritius and Comoro Ids; Id. PCH.

**Otolith shape:** Ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded;



**sculpture**, lobed or irregular. **Ventral margin**: Rounded and slightly irregular. **Posterior margin**: Flat or slightly emarginate and irregular. **Sulcus acusticus**: Ostial, heterosulcoid. **Colliculum**: Heteromorph, slightly raised colliculi. **Pseudocolliculum**: Absent. **Ostium**: Slightly flared. **Cauda**: Approximately straight becoming flexed, tip rounded. **Ostio-caudal differentiation**: Slightly dorso-ventral constricted. **Ostium/cauda**: 1:0.8, 1:0.7. **Collum**: Absent. **Crista superior**: Well developed along entire sulcus. **Crista inferior**: Poorly developed under anterior ostium, well developed elsewhere. **Dorsal depression**: May be shallow. **Ventral depression**: Absent. **Rostrum**: Large and sharply rounded. **Antirostrum**: Absent or very small and rounded. **Excisura**: Moderately wide, notch very shallow, angle wide.

***Paracanthurus hepatus*, SSF No. 243.16 PLATE 131**

**DISTRIBUTION**: Natal to central Pacific. Attains c. 26 cm.

**MATERIAL**: 3/9 (1.7-2.8 mm OD, 46-133 mm TL), PEM 7696 (RUSI 28471), 0485, 6781; PEO and ORI; Id. GJBR, MJS, PCH.

**Otolith shape**: Ovate. **Thickness**: Moderate. **Form**: - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin**: Slightly rounded; **sculpture**, lobed or irregular. **Ventral margin**: Well rounded and crenate or irregular. **Posterior margin**: Flat and irregular. **Sulcus acusticus**: Ostial, heterosulcoid. **Colliculum**: Heteromorph, very low colliculi. **Pseudocolliculum**: Absent. **Ostium**: Deep anteriorly, flared, mainly on rostrum. **Cauda**: Deep, approximately straight then flexed at rounded tip. **Ostio-caudal differentiation**: Gentle dorso-ventral curves. **Ostium/cauda**: 1:0.9, 1:0.9, 1:1.1. **Collum**: Absent. **Crista superior**: Ridge-like from mid-ostium to mid-cauda, well developed at extremes. **Crista inferior**: Well developed along entire sulcus. **Dorsal depression**: Oval and deep. **Ventral depression**: Absent. **Rostrum**: Large, broad and sharply rounded or rounded. **Antirostrum**: Moderately large and sharply rounded. **Excisura**: Moderately wide, notch moderately deep, angle wide.

***Zebrasoma gemmatum*, SSF No. 243.17 PLATE 131**

**DISTRIBUTION**: Mauritius, Madagascar, Sodwana Bay and Durban. Attains at least 22 cm.

**MATERIAL**: 1/1 (4.8 mm OD, 176 mm TL), PEM 14806; St Lucia Marine Reserve; Id. MJS.

**Otolith shape**: Rounded ovate. **Thickness**: Thick. **Form**: - Mesial very convex, - Lateral very concave. **Dorsal margin**: Rounded; **sculpture**, irregular. **Ventral margin**: Rounded and slightly irregular. **Posterior margin**: Rounded and irregular. **Sulcus acusticus**: Ostial, heterosulcoid. **Colliculum**: Heteromorph, bulbous in posterior part of ostium, posterior indistinct. **Pseudocolliculum**: Absent. **Ostium**: Very flared, short and deep anteriorly. **Cauda**: Very deep, approximately straight then flexed. **Ostio-caudal differentiation**: Dorso-ventral narrowing. **Ostium/cauda**: 1:1.9. **Collum**: Absent. **Crista superior**: Well developed along entire sulcus. **Crista inferior**: Well developed under cauda but poor under ostium. **Dorsal depression**: Oval and very shallow. **Ventral depression**: Absent. **Rostrum**: Short, broad and rounded. **Antirostrum**: Small and pointed. **Excisura**: Wide, notch deep, angle wide.

***Zebrasoma scopas*, SSF No. 243.18 PLATE 131**

**DISTRIBUTION**: Common throughout most of Indo-Pacific region, south to Natal. Attains 20 cm.

**MATERIAL**: 3/6 (2.0-3.6 mm OD, 54-175 mm TL), PEM 7698 (RUSI 28470), 10625, 10626; ORI; Id. MJS, PCH.

**Otolith shape**: Rounded-ovate. **Thickness**: Very thick. **Form**: - Mesial very convex, Lateral approximately flat. **Dorsal margin**: Well rounded; **sculpture**, irregular. **Ventral margin**: Rounded and slightly irregular. **Posterior margin**: Bluntly rounded and irregular, juveniles (c. 2 mm OD) more rounded. **Sulcus ac-**

**ticus**: Ostial, heterosulcoid. **Colliculum**: Heteromorph, colliculi very low. **Pseudocolliculum**: Absent. **Ostium**: Deep, flared, lying mainly on rostrum. **Cauda**: Deep, short and strongly flexed with slightly pointed tip. Juveniles (2 mm OD) shallower, and gently flexed. **Ostio-caudal differentiation**: Ventrally constricted. **Ostium/cauda**: 1:1.4, 1:0.9, 1:0.9. **Collum**: Absent, may be a step up to cauda. **Crista superior**: Well developed along entire sulcus may be ridge-like over anterior cauda. **Crista inferior**: Poorly developed under anterior ostium, well developed elsewhere. **Dorsal depression**: Oval and very shallow. **Ventral depression**: Absent. **Rostrum**: Short, very broad and rounded. **Antirostrum**: Small becoming large and pointed. **Excisura**: Moderately wide or wide, notch shallow becoming deep, angle acute.

***Zebrasoma veliferum*, SSF No. 243.19 PLATE 132**

**DISTRIBUTION**: Indo-Pacific, south to Natal. Attains 40 cm.

**MATERIAL**: 2/3 (3.4, 4.1 mm OD, 135, 194 mm TL), PEM 6460, 15031 (RUSI 35590); PEO; Id. MJS, PCH.

**Otolith shape**: Approximately ovate. **Thickness**: Moderate. **Form**: - Mesial convex, - Lateral concave. **Dorsal margin**: Slightly rounded; **sculpture**, irregular. **Ventral margin**: Rounded and slightly irregular. **Posterior margin**: Flat and irregular. **Sulcus acusticus**: Ostial, heterosulcoid. **Colliculum**: Heteromorph and very low, posterior crystalline. **Pseudocolliculum**: Absent. **Ostium**: Flared anteriorly and elongate. **Cauda**: Approximately straight, gently flexed near tip and moderately deep. **Ostio-caudal differentiation**: Slight dorso-ventral narrowing. **Ostium/cauda**: 1:1.2, 1:1. **Collum**: Absent. **Crista superior**: Ridge-like over posterior ostium to anterior cauda, well developed elsewhere. **Crista inferior**: Well developed, poor under ostium. **Dorsal depression**: Oval and shallow. **Ventral depression**: Absent. **Rostrum**: Moderate, broad and rounded. **Antirostrum**: Minute and rounded or sharply rounded. **Excisura**: Moderately wide, notch very shallow, angle wide.

***Naso annulatus*, SSF No. 243.20 PLATE 132**

**DISTRIBUTION**: Indo-Pacific, south to Natal. Attains at least 100 cm.

**MATERIAL**: 1/1 (c. 5 mm OD (damaged tip), 490 mm TL), PEM 0621; Durban Aquarium; Id. GJBR.

**Otolith shape**: Oblong-ovate. **Thickness**: Moderate. **Form**: - Mesial convex, - Lateral concave. **Dorsal margin**: Raised and rounded; **sculpture**, very irregular. **Ventral margin**: Slightly rounded and irregular. **Posterior margin**: Flat and oblique, dentate or irregular. **Sulcus acusticus**: Ostial, heterosulcoid. **Colliculum**: Heteromorph, colliculi low and indistinct. **Pseudocolliculum**: Absent. **Ostium**: Moderately deep and very elongate with parallel sides. **Cauda**: Approximately horizontal and slightly sinuate with sharp flexion, tip near ventral margin. **Ostio-caudal differentiation**: Slight dorsal narrowing. **Ostium/cauda**: c. 1:0.7. **Collum**: Absent, slight step up to cauda. **Crista superior**: Ridge-like over neck and anterior cauda, well developed over ostium and caudal flexion. **Crista inferior**: Ridge-like from mid-ostium to flexion, poorly developed under anterior ostium, well developed at caudal tip. **Dorsal depression**: Oval and deep. **Ventral depression**: Elongate along sulcus to flexion. **Rostrum**: Tip broken. **Antirostrum**: Minute and sharply rounded. **Excisura**: Moderate, notch very shallow, angle acute.

***Naso brevirostris*, SSF No. 243.22 PLATE 132**

**DISTRIBUTION**: Indo-Pacific, south to Durban, young to Algoa Bay. Attains at least 50 cm.

**MATERIAL**: 2/3 (4.7, 5.0 mm OD, 255, 300 mm TL), PEM 14560 (RUSI 34099), 15661; Mauritius, Comoro Ids; Id. MJS, PCH.

**Otolith shape**: Ovate. **Thickness**: Moderate. **Form**: - Mesial convex, - Lateral slightly concave. **Dorsal margin**: Approxi-



mately flat and oblique; **sculpture**, irregular. **Ventral margin**: Rounded, sinuate and serrate. **Posterior margin**: Flat, approximately vertical and serrate. **Sulcus acusticus**: Ostial, heterosulcoid. **Colliculum**: Heteromorph, colliculi indistinct. **Pseudocolliculum**: Absent. **Ostium**: Very elongate and narrow, lying mainly on rostrum, deepest in middle. **Cauda**: Slightly sinuate, strongly flexed, very deep posteriorly undercutting ventral area. **Ostio-caudal differentiation**: Slightly dorso-ventrally constricted. **Ostium/cauda**: 1:0.6, 1:0.8. **Collum**: Absent, low step to cauda. **Crista superior**: Ridge-like from mid-ostium to flexion, well developed at extremes. **Crista inferior**: Ridge-like from mid-ostium to flexion, well developed elsewhere. **Dorsal depression**: Oval and deep. **Ventral depression**: Absent, may be a shallow bifid groove from under ostium to flexion. **Rostrum**: Elongate, moderately broad and sharply rounded. **Antirostrum**: Small and pointed. **Excisura**: Wide, notch very deep or shallow with groove, angle acute.

#### *Naso tuberosus*, SSF No. 243.29 PLATE 132

**DISTRIBUTION**: Natal to Gilbert Is. Attains at least 60 cm.

**MATERIAL**: 1/1 (4.9 mm OD, 331 mm TL), PEM 14535; Mauritius; Id. MJS.

**Otolith shape**: Oblong-ovate. **Thickness**: Moderately thin. **Form**: - Mesial slightly convex, - Lateral concave. **Dorsal margin**: Approximately flat; **sculpture**, crenate and irregular. **Ventral margin**: Slightly rounded and serrate to dentate. **Posterior margin**: Flat and irregular. **Sulcus acusticus**: Ostial, heterosulcoid. **Colliculum**: Heteromorph, indistinct colliculi. **Pseudocolliculum**: Absent. **Ostium**: Very elongate and narrow, slightly flared. **Cauda**: Flared and slightly flexed posteriorly, posterior wall poorly defined. **Ostio-caudal differentiation**: Slight dorso-ventral narrowing. **Ostium/cauda**: 1:0.5. **Collum**: Absent, step up to cauda. **Crista superior**: Ridge-like from mid-ostium to flexion, well developed over anterior ostium, poorly developed after flexion. **Crista inferior**: Ridge-like under posterior ostium, well developed under cauda, poorly developed under anterior ostium. **Dorsal depression**: Oval and deep. **Ventral depression**: Absent, narrow and deep, slit-like groove under ostium. **Rostrum**: Moderate, broad and sharply rounded. **Antirostrum**: Small and sharply rounded. **Excisura**: Moderately wide, notch shallow, angle acute.

#### ACANTHURIDAE Nelson No. 409 (ZANCLIDAE in SSF)

**Family characteristics**: One species described. Otolith approximately discoid and moderately small, up to c. 4 mm OD. Heterosulcoid with ostial opening, ostium and cauda similar width and not obviously differentiated, sulcus approximately horizontal, slightly curved, ends close to posterior margin. Heteromorph, colliculi very low. Crista superior ridge-like along its length.

**NOTE**: Although this genus is included in the Acanthuridae by Nelson, the differences between the otoliths suggest that it should not be included there.

#### *Zanclus canescens*, SSF No. 244.1 PLATE 132

**DISTRIBUTION**: From Africa to Mexico but not in the Red Sea. Juveniles reach Mossel Bay. Attains 22 cm.

**MATERIAL**: 3/6 (2.55-3.9 mm OD, 77-204 mm TL), PEM 4153, 11302, 6761; Kosi Bay and PEO; Id. MJS.

**Otolith shape**: Approximately discoid. **Thickness**: Moderately thick. **Form**: - Mesial very convex, - Lateral concave. **Dorsal margin**: Flat, oblique or raised; **sculpture**, slightly irregular. **Ventral margin**: Well rounded and irregular. **Posterior margin**: Rounded, lobed and irregular. **Sulcus acusticus**: Ostial, heterosulcoid. **Colliculum**: Heteromorph, very low colliculi. **Pseudocolliculum**: Absent. **Ostium**: Slightly flared, not easily

distinguishable from cauda. **Cauda**: Approximately horizontal with rounded tip and very slightly flexed, width constant along its length, ends near margin. **Ostio-caudal differentiation**: Very slightly ventrally constricted. **Ostium/cauda**: 1:1.2, 1:1.2, 1:1.1. **Collum**: Absent. **Crista superior**: Ridge-like from ostium to cauda. **Crista inferior**: Well developed along its length. **Dorsal depression**: Elongate and straight over cauda. **Ventral depression**: Absent but posterior depression close to margin. **Rostrum**: Moderate, broad, tapered and pointed or blunt. **Antirostrum**: Moderate and pointed. **Excisura**: Moderately wide, notch deep, angle acute.

#### SIGANIDAE Nelson No. 410

**Family characteristics**: Three species described. Otoliths ovate to fusiform, up to at least 4.2 mm OD. Heterosulcoid with narrow ostium along edge of rostrum and antirostrum, cauda deep and strongly flexed, poorly defined posteriorly. Heteromorph with very indistinct colliculi. Rostrum elongate, distinct antirostrum with deep excisural notch.

##### Key

- 1a. Posterior margin of otolith rounded; rostrum elongate, sharply rounded not tapered; dorsal margin of rostrum crenate; cauda only slightly flexed, ventral groove does not penetrate caudal tip . . . . . *Siganus stellatus* 245.1
- 1b. Posterior margin of otolith oblique, may be emarginate; rostrum tapers when elongate; dorsal margin of rostrum entire; cauda flexed, ventral groove penetrates caudal tip . . . . . 2
- 2a. Crista inferior ridge-like under ostium; ventral groove elongate along entire ventral area; posterior margin of otolith flat or slightly rounded and lobed . . . . . *Siganus sutor* 245.2
- 2b. Crista inferior poorly developed under ostium; ventral groove very short, only reaches flexion; posterior margin emarginate and crenate . . . . . *Siganus argenteus* 245.-

#### *Siganus argenteus*, (Quoy & Gaimard, 1825) SSF No. 245.- PLATE 132

**DISTRIBUTION**: From the east coast of Africa and Red Sea throughout the tropical Indo-Pacific to the Tuomoto Ids, including Madagascar, Mauritius, Seychelles, Laccadives and Maldives. Attains 35 cm, common to 25 cm (Woodland, 1984).

**MATERIAL**: 1/1 (1.85 mm OD, 110 mm TL), PEM 15394 (RUSI 40576); Bazaruto; Id. PCH.

**Otolith shape**: Ovate to fusiform. **Thickness**: Moderately thick. **Form**: - Mesial slightly convex, - Lateral slightly concave. **Lateral surface**: V-shaped depression from nucleus to posterior margin. **Dorsal margin**: Oblique and angled; **sculpture**, slightly irregular. **Ventral margin**: Slightly rounded and slightly crenate. **Posterior margin**: Oblique, slightly emarginate and crenate to lobed. **Sulcus acusticus**: Ostial, heterosulcoid. **Colliculum**: Heteromorph, colliculi very indistinct. **Pseudocolliculum**: Absent. **Ostium**: Reduced and narrow along margins of rostrum and antirostrum. **Cauda**: Deep, strongly flexed with posterior margin poorly defined. **Ostio-caudal differentiation**: Dorsally constricted. **Ostium/cauda**: 1:0.9. **Collum**: Very low and narrow. **Crista superior**: Ridge-like over ostium, poorly developed over cauda. **Crista inferior**: Poorly developed under anterior ostium and caudal tip, low ridge to flexion. **Dorsal depression**: Shallow above ridge. **Ventral depression**: Groove-like below flexion, penetrates crista near tip. **Rostrum**: Elongate, narrow and sharply rounded. **Antirostrum**: Narrow, tapering and pointed. **Excisura**: Wide, notch deep, angle acute.



### *Siganus stellatus*, SSF No. 245.1 PLATE 132

**DISTRIBUTION:** Kosi Bay northwards, on coral reefs throughout the Red Sea, west and central Indian Ocean, and Andaman Sea. Attains 40 cm.

**MATERIAL:** 1/1 (4.25 mm OD, 260 mm TL, otolith damaged), 1171H; Nabek, south Sinai; Id. AD.

**Otolith shape:** Fusiform. **Thickness:** Thin. **Form:** - Mesial convex, - Lateral slightly concave. **Dorsal margin:** Slightly rounded; **sculpture**, crenate. **Ventral margin:** Flat and crenate. **Posterior margin:** Rounded, crenate and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, colliculi very indistinct. **Pseudocolliculum:** Absent. **Ostium:** Very reduced and narrow, deep, lying mainly along antirostrum. **Cauda:** Deep, slightly flexed at tip and moderately wide. **Ostio-caudal differentiation:** Dorsally constricted. **Ostium/cauda:** 1:0.7. **Collum:** Absent. **Crista superior:** Well developed above ostium, ridge-like at neck, well developed above cauda. **Crista inferior:** Uneven and ridge-like below ostium and cauda, tip well developed. **Dorsal depression:** Deep, penetrates dorsal crista. **Ventral depression:** Absent, only a groove under crista. **Rostrum:** Large, elongate and sharply rounded. **Antirostrum:** Narrow and pointed. **Excisura:** Wide, notch very deep, angle acute.

### *Siganus sutor*, SSF No. 245.2 PLATE 132

**DISTRIBUTION:** Restricted to western Indian Ocean: South Africa (Knysna) to Kenya, Seychelles, Comoro Ids, Madagascar, Reunion, Mauritius and Rodrigues. Attains 45 cm.

**MATERIAL:** 3/4 (1.85-4.15 mm OD, 102-305 mm TL), PEM 0178, 14551 (RUSI 31449), 0326; PEO, Mauritius and Algoa Bay; Id. GJBR, MJS, PCH.

**Otolith shape:** Ovate becoming fusiform (>c. 3 mm OD). **Thickness:** Moderately thin. **Form:** - Mesial convex, - Lateral slightly concave. **Lateral surface:** Indented or raised along mid-line under sulcus. **Dorsal margin:** Approximately flat; **sculpture**, crenate or irregular. **Ventral margin:** Slightly rounded becoming flat and crenate or irregular. **Posterior margin:** Slightly rounded, becoming flattened, oblique with broad lobes (c. 3.2 mm OD). **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, colliculi indistinct. **Pseudocolliculum:** Absent. **Ostium:** Narrow and deep, straight ventrally, reduced, flared mainly along antirostrum. **Cauda:** Wide, flexed and deepening postero-ventrally, undercuts ventral area. **Ostio-caudal differentiation:** Dorsally constricted. **Ostium/cauda:** 1:0.8, 1:0.7, 1:0.7. **Collum:** Well developed, narrow. **Crista superior:** Well developed or ridge-like over ostium and neck, ridge joins collum, poorly defined over deep cauda. **Crista inferior:** Ridge-like under ostium and cauda, poorly developed at extremes. **Dorsal depression:** Penetrates dorsal crista at neck. **Ventral depression:** From tip of cauda running to rostrum as a groove. **Rostrum:** Large, elongate and pointed. **Antirostrum:** Moderately large, tapered and pointed. **Excisura:** Wide, notch deep, angle acute.

### GEMPYLIDAE Nelson No. 412

**Family characteristics:** Six species described. Otoliths elliptic to ovate or fusiform, up to at least 14 mm OD. Heterosulcoid, pseudo-archaesulcoid or archaesulcoid. Openings ostial, some become ostio-caudal with growth. Ostium elongate, cauda usually short, walls poorly defined or with very low ridge. Sulcus straight or curved, banana-like. Homomorph or heteromorph, colliculi low and indistinct. Rostrum usually elongate and tapered. Otoliths of juveniles of this family are extremely similar and are difficult to distinguish from each other.

### Key

- 1a. Otolith oblong to fusiform, not elliptic; antirostrum distinct, moderately large and broad . . . . . *Gempylus serpens* 247.2
- 1b. Otolith elliptic to ovate or elliptic to fusiform; antirostrum small or short and broad . . . . . 2
- 2a. Rostrum relatively small . . . . . 3
- 2b. Rostrum elongate and tapered . . . . . 5
- 3a. Antirostrum very small; otolith shape elliptic; excisural notch shallow; distinct notch in postero-ventral corner of otolith with overhanging lobe on posterior margin . . . . . *Neopinnula orientalis* 247.4
- 3b. Antirostrum usually distinct but tapered; excisural notch moderately shallow; posterior margin of otolith may be notched at mid-point, no over-hanging lobe on posterior margin . . . . . 4
- 4a. Crista inferior low but distinct and ridge-like under cauda, poorly developed under ostium; dorsal depression shallow; ventral depression below cauda . . . . . *Promethichthys prometheus* 247.-
- 4b. Crista inferior extremely low and indistinct but very low ridge under mid-sulcus, poorly developed under cauda; dorsal and ventral depressions absent . . . . . *Rexia prometheoides* 247.6
- 5a. Ventral margin of otolith rounded; rostrum large, tapered and pointed, not bifid; cauda ends close to posterior margin; sulcus opening becomes ostio-caudal; notch in posterior margin of otolith deepens, erodes postero-dorsal area . . . . . *Thyrsites atun* 247.8
- 5b. Ventral margin of otolith slightly rounded; rostrum large, tapered with bifid tip; cauda ends short of posterior margin of otolith; notch in posterior margin of otolith shallow; dorsal area of otolith elongate . . . . . *Thyrsitoides marleyi* 247.9

### *Gempylus serpens*, SSF No. 247.2 PLATE 133

**DISTRIBUTION:** Worldwide in tropical and subtropical waters; sometimes in temperate latitudes. Attains 1 m.

**MATERIAL:** 4/4 (2.95-3.6 mm OD, 367-470 mm TL), PEM 0537a, 9639 (RUSI 37443), 0537b, 14332 (2 Californian specimens in 0537); Algoa Bay and California; Id. MJS, PCH, JEF.

**Otolith shape:** Oblong to fusiform. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex or flat. - Lateral concave. **Dorsal margin:** Flat; **sculpture**, notched and crenate or lobed. **Ventral margin:** Slightly rounded or flat, slightly irregular or crenate. **Posterior margin:** Rounded, crenate or lobed. **Sulcus acusticus:** Ostial, heterosulcoid, may appear archaesulcoid if not coated. **Colliculum:** Heteromorph, extremely low and indistinct. **Pseudocolliculum:** Absent. **Ostium:** Flares, lies mainly along rostrum, very poorly defined. **Cauda:** Slightly flexed, very shallow, wide and very poorly defined posteriorly. **Ostio-caudal differentiation:** Slightly dorsally constricted. **Ostium/cauda:** 1:1.2, 1:1, 1:1, 1:1. **Collum:** Absent. **Crista superior:** May be well developed above ostium and neck, poorly developed over cauda. **Crista inferior:** Low ridge below neck, poorly developed under ostium and very poor under caudal tip. **Dorsal depression:** Very shallow. **Ventral depression:** Absent. **Rostrum:** Large, moderately elongate and sharply rounded. **Antirostrum:** Moderately large and sharply rounded. **Excisura:** Wide, notch moderately deep, angle acute.

### *Neopinnula orientalis*, SSF No. 247.4 PLATE 133

**DISTRIBUTION:** Found in all oceans near edge of continental shelf and islands. Attains c. 30 cm.



**MATERIAL:** 6/30 (4.3-7.1 mm OD, 127-245 mm TL), PEM 14427 (RUSI 28473), 12472 (RUSI 34080), 3708, 13009, 13005, 13008, [12471 (RUSI 37080), 12539 (RUSI 34069), 12540 (RUSI 34063), 12974 (RUSI 34072), 14426 (RUSI 28473)]; Mozambique and Cape south coast; Id. MJS, PCH.

**Otolith shape:** Elliptic. **Thickness:** Moderately thin. **Form:** - Mesial flat, - Lateral flat. **Dorsal margin:** Slightly rounded; **sculpture,** dentate or crenate. **Ventral margin:** Slightly rounded, dentate or crenate. **Posterior margin:** Slightly rounded, notched and lobed. **Sulcus acusticus:** Ostial, archaesusulcoid. **Colliculum:** Homomorph, single indistinct colliculum indented in centre. **Pseudocolliculum:** Absent. **Ostium and cauda:** Undifferentiated, sulcus slightly flared antero-dorsally, posterior sulcus tip poorly defined. **Ostio-caudal differentiation:** Absent. **Collum:** Absent.

**Crista superior:** Low ridge over posterior two thirds of sulcus, absent at extremes. **Crista inferior:** Low ridge along sulcus. **Dorsal depression:** Shallow over most of dorsal area. **Ventral depression:** Elongate and shallow under crista. **Rostrum:** Moderate, broad and pointed. **Antirostrum:** Absent or very small and sharply rounded. **Excisura:** Moderately wide, notch shallow, angle varies.

*Promethichthys prometheus*, (Cuvier, 1831)

**SSF No. 247.- PLATE 133**

**DISTRIBUTION:** In tropical and temperate waters of the eastern Indian Ocean, western central Pacific and Atlantic Oceans. Known from the northern part of the Mozambique channel and off Kerala (India); also recorded from Kenya. Attains 60 cm SL (Nakamura, 1984).

**MATERIAL:** 2/3 (7.72, 7.96 mm OD, 320, 330 mm SL), PEM 15342, 15340; Comoro Ids; Id. PCH.

**Otolith shape:** Elliptic to ovate. **Thickness:** Thin. **Form:** - Mesial flat, - Lateral flat. **Dorsal margin:** Slightly rounded; **sculpture,** crenate or irregular. **Ventral margin:** Slightly rounded, dentate or irregular. **Posterior margin:** Rounded, notched and lobed. **Sulcus acusticus:** Ostial, pseudo-archaesusulcoid. **Colliculum:** Heteromorph, low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Elongate, walls poorly defined, sulcus flexed upward, banana-like. **Cauda:** Short, poorly defined walls with rounded tip. **Ostio-caudal differentiation:** No constrictions. **Ostium/cauda:** 1:0.5, 1:0.4. **Collum:** Absent. **Crista superior:** Very poorly developed over ostium, very low ridge from neck to tip, absent at tip. **Crista inferior:** Very poorly developed under ostium, low but distinct ridge from neck to tip, absent at tip. **Dorsal depression:** Very shallow, large and oval. **Ventral depression:** Very shallow and oval under ridge. **Rostrum:** Large, broad, tapered and sharply rounded. **Antirostrum:** Moderate and sharply rounded. **Excisura:** Moderately wide, notch moderately shallow, angle acute.

*Rexea prometheoides*, SSF No. 247.6 PLATE 133

**DISTRIBUTION:** Japan, Indonesia and northern Australia from Mozambique and Kenya. Attains c. 40 cm.

**MATERIAL:** 3/3 (3.2-5.5 mm OD, 155-210 mm TL), PEM 12885 (RUSI 28467), 13329, 12768 (RUSI 28484); Cape south and west coasts and Mozambique; Id. MJS, PCH.

**Otolith shape:** Elliptic becoming ovate (c. 5.5 mm OD). **Thickness:** Moderately thin. **Form:** - Mesial flat. - Lateral flat. **Dorsal margin:** Slightly rounded; **sculpture,** crenate or slightly irregular. **Ventral margin:** Rounded and crenate, serrate and dentate. **Posterior margin:** Rounded, notched, lobed or irregular. **Sulcus acusticus:** Ostial, archaesusulcoid. **Colliculum:** Homomorph, single colliculum, depressed in centre. **Pseudocolliculum:** Absent. **Ostium and cauda:** Undifferentiated, sulcus curves up anteriorly and posteriorly, banana-shaped. **Ostio-caudal differentiation:** No constrictions. **Collum:** Absent. **Crista superior:** Very low ridge in mid-section, very poorly developed at extremes. **Crista**

**inferior:** Very low ridge in centre, very poorly developed under anterior, absent posteriorly. **Dorsal depression:** Absent. **Ventral depression:** Absent. **Rostrum:** Short becoming elongate (c. 5.5 mm OD) and sharply rounded. **Antirostrum:** Absent or moderate and sharply rounded. **Excisura:** Narrow becoming moderate, notch shallow becoming moderately deep, angle acute.

*Thyrsites atun*, SSF No. 247.8 PLATE 133

**DISTRIBUTION:** Mesopelagic in cold waters of the southern hemispheres. Common in southern Australia, New Zealand, southern South America and South Africa. Attains 2 m.

**MATERIAL:** 4/70 (3.5-14.28 mm OD, 133-950 mm SL), PEM 7376 (RUSI 34157), 3589, 10597, 1253; Cape west and south coasts; Id. MJS, PCH.

**Otolith shape:** Elliptic becoming fusiform (c. 9 mm OD). **Thickness:** Moderately thin. **Form:** - Mesial flat or slightly convex, - Lateral flat or slightly concave. **Dorsal margin:** Rounded; **sculpture,** lobed and irregular. **Ventral margin:** Rounded, crenate and serrate. **Posterior margin:** Rounded, notched, becoming very notched with growth, and irregular. **Sulcus acusticus:** Ostial, becoming ostio-caudal with growth (>c. 9 mm OD), pseudo-archaesusulcoid or heterosulcoid. **Colliculum:** Heteromorph, very low indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Elongate and poorly defined, lying mainly on rostrum. **Cauda:** Short, straight, poorly defined margins, opens to a posterior notch in large otoliths (>9 mm OD). **Ostio-caudal differentiation:** Absent or may be dorsally constricted. **Ostium/cauda:** 1:0.5, 1:0.7, 1:0.6, 1:0.7. **Collum:** Absent. **Crista superior:** Poorly developed along sulcus, large otoliths (c. 9 mm) may have a low ridge over the neck. **Crista inferior:** Absent under ostium, poorly developed under cauda, may be very low ridge under neck. **Dorsal depression:** Very shallow and large. **Ventral depression:** Absent. **Rostrum:** Moderate to elongate and broad, pointed. **Antirostrum:** Minute becoming moderate and sharply rounded. **Excisura:** Moderate to very wide with growth, notch moderate becoming deep, angle varies.

*Thyrsitoides marleyi*, SSF No. 247.9 PLATE 133

**DISTRIBUTION:** Indo-West Pacific, south to Algoa Bay and north to Japan. Attains 200 cm.

**MATERIAL:** 4/7 (5.05-8.5 mm OD, 186-987 mm TL), PEM 5066, 5065, 14449, 14868 (RUSI 35537), [14870 (RUSI 35535), 14869 (RUSI 35541)]; Cape south coast and Kenya; Id. MJS, PCH.

**Otolith shape:** Elliptic to fusiform. **Thickness:** Moderately thin. **Form:** - Mesial flat, - Lateral flat. **Dorsal margin:** Slightly rounded; **sculpture,** crenate or lobed. **Ventral margin:** Slightly rounded, crenate or irregular. **Posterior margin:** Rounded, notched, lobed and irregular. **Sulcus acusticus:** Ostial, pseudo-archaesusulcoid or heterosulcoid. **Colliculum:** Heteromorph, indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Elongate and flared slightly, dorsal wall of rostrum raised in large otoliths (c. 6 mm OD). **Cauda:** Short and may be slightly flexed, tip rounded and poorly defined. **Ostio-caudal differentiation:** Absent or slightly dorsally constricted. **Ostium/cauda:** 1:0.4, 1:0.6, 1:0.6, 1:0.8. **Collum:** Absent. **Crista superior:** Very low ridge from ostium to cauda, absent at tip. **Crista inferior:** Very low ridge from ostium to cauda. **Dorsal depression:** Very shallow, over most of area, oval shaped. **Ventral depression:** Absent. **Rostrum:** Broad, tapered, elongate and pointed, may have bifid tip in large otoliths (c. 7 mm OD). **Antirostrum:** Small becoming moderate (c. 7 mm OD) and sharply rounded. **Excisura:** Moderately wide becoming wide, notch moderate, angle acute.

**TRICHIURIDAE Nelson No. 413**

**Family characteristics:** Otoliths oblong to fusiform, up to at least 8 mm OD. Archaesusulcoid or pseudo-archaesusulcoid sulcus, open-



ings mesial or ostial, usually shallow. Colliculi homomorph or heteromorph, usually indistinct.

**Key**

- 1a. Otolith oblong; sulcus archaesusulcoid and very shallow; sulcus opening mesial except largest of individuals which may have extremely narrow and indistinct ostial opening . . . *Benthodesmus elongatus elongatus* 248.3
- 1b. Otolith oblong or oblong to fusiform; sulcus pseudo-archaesusulcoid; ostium moderately deep; sulcus opening ostial . . . . . 2
- 2a. Rostrum relatively elongate and tapered; posterior margin of otolith tapered, sharply rounded or pointed; lateral surface of otolith slightly indented along its length . . . . . *Lepidopus caudatus* 248.4
- 2b. Rostrum relatively small, tapered and pointed; posterior margin of otolith sharply rounded and irregular; lateral surface of otolith very concave with deep trough in midline . . . . . *Trichiurus lepturus* 248.6

***Benthodesmus elongatus elongatus*, SSF No. 248.3  
PLATE 134**

**DISTRIBUTION:** New Zealand, Australia and South Africa. Attains c. 1 m.

**MATERIAL:** 4/7 (3.45-6.1 mm OD, 400-872 mm TL), PEM 5052 (RUSI 14050), 14906 (RUSI 35573), 13428, 13427, [5051 (RUSI 14050)]; Cape west coast, Kenya and Cape south coast; Id. MJS, PCH.

**Otolith shape:** Oblong. **Thickness:** Moderate. **Form:** - Mesial flat, - Lateral flat. **Lateral surface:** Slight depression under sulcus in smallest otoliths (c. 4 mm OD). **Dorsal margin:** Slightly rounded; **sculpture**, notched, crenate and irregular. **Ventral margin:** Slightly rounded, slightly irregular. **Posterior margin:** Sharply rounded and irregular. **Sulcus acusticus:** Mesial becoming ostial in large otoliths (c. 6.1 mm OD), but opening indistinct, archaesusulcoid. **Colliculum:** Homomorph, indistinct colliculum. **Pseudocolliculum:** Absent. **Ostium** and **cauda:** Undifferentiated, sulcus poorly defined, shallow depression. **Ostio-caudal differentiation:** No constrictions. **Collum:** Absent. **Crista superior:** Poorly developed, may be a very low ridge in mid-sulcus. **Crista inferior:** Poorly developed, may be low ridge in mid-sulcus. **Dorsal depression:** May be depression in posterior third of area. **Ventral depression:** Absent. **Rostrum:** Absent or small and sharply rounded. **Antirostrum:** Absent. **Excisura:** Absent or very narrow, notch absent or very shallow, angle wide.

***Lepidopus caudatus*, SSF No. 248.4 PLATE 134**

**DISTRIBUTION:** Mediterranean, eastern Atlantic from Norway and Iceland to South Africa, Australia and New Zealand. Attains c. 2 m.

**MATERIAL:** 4/160 (2.3-7.68 mm OD, 227-2630 mm TL), PEM 7500 (RUSI 28472), 12225, 9588, 3940; Cape south and east coasts; Id. MJS, PCH.

**Otolith shape:** Oblong to fusiform. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral concave. **Lateral surface:** Slightly indented along its length. **Dorsal margin:** Rounded; **sculpture**, lobed or irregular. **Ventral margin:** Slightly rounded, crenate or irregular. **Posterior margin:** Tapered, sharply rounded and entire. **Sulcus acusticus:** Ostial, may appear mesial, pseudo-archaesusulcoid. **Colliculum:** Heteromorph, low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Deeper than cauda, slightly flared and poorly defined. **Cauda:** Shallow, filled with colliculum. **Ostio-caudal differentiation:** Absent. **Ostium/cauda:** 1:1, 1:0.9, 1:0.9, 1:0.8. **Collum:** Absent. **Crista superior:** Well developed or low ridge from mid-ostium to cauda, poorly developed at extremes. **Crista inferior:** Low ridge from neck to cauda, poorly

developed under ostium. **Dorsal depression:** Absent. **Ventral depression:** Absent. **Rostrum:** Moderately long, broad, tapered and pointed. **Antirostrum:** Small and sharply rounded. **Excisura:** Moderate to wide, notch very shallow, angle wide.

***Trichiurus lepturus*, SSF No. 248.6 PLATE 134**

**DISTRIBUTION:** Cosmopolitan species of tropical and temperate waters. Attains 2 m.

**MATERIAL:** 4/55 (2.35-7.06 mm OD, 246-790 mm TL), PEM 1707, 11721 (RUSI 28492), 12735, 1708, [12957 (RUSI 34076)]; off Durban and Cape south coast; Id. MJS, PCH.

**Otolith shape:** Approximately oblong. **Thickness:** Moderate. **Form:** - Mesial convex or flat, - Lateral concave or flat. **Lateral surface:** Concave with elongate, moderately deep trough along otolith midline. **Dorsal margin:** Rounded; **sculpture**, crenate or irregular. **Ventral margin:** Slightly rounded, crenate or slightly irregular. **Posterior margin:** Sharply rounded, lobed and irregular. **Sulcus acusticus:** Ostial, pseudo-archaesusulcoid. **Colliculum:** Heteromorph, very low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Flares slightly, distinguishable by shape of floor. **Cauda:** Short, shallow, poorly defined, narrows posteriorly. **Ostio-caudal differentiation:** Absent. **Ostium/cauda:** 1:0.9, 1:0.7, 1:0.8, 1:0.6. **Collum:** Absent. **Crista superior:** Low ridge from ostium to cauda, tip poorly developed. **Crista inferior:** Low ridge along entire sulcus but poorly developed at tip. **Dorsal depression:** Shallow and oval. **Ventral depression:** Narrow, below crista. **Rostrum:** Moderately large and pointed. **Antirostrum:** Small, pointed or rounded. **Excisura:** Moderate, notch very shallow, angle wide.

**SCOMBRIDAE Nelson No. 414**

**Family characteristics:** Otoliths ovate, angular, fusiform or oblong, may have pointed rostra and otoliths may attain at least 22 mm OD, but are thin and fragile. Heterosulcoid with ostial openings although posterior margin may erode to meet caudal tip. Sulcus often deep, ostium often covers most of rostrum, cauda usually deep, slightly flared and slightly flexed at tip. Dorsal and ventral areas reduced and narrow, usually with grooves making cristae ridge-like. Colliculi often very poorly defined, may be low and indistinct, anterior may be nodular in ostium.

**Key**

- 1a. Otoliths rectangular; rostrum a short, pointed spike-like projection; ostium widely flared dorsally and ventrally with pit in dorsal margin of ostium (if spike-like rostrum damaged, anterior margin appears blunt and rostrum apparently absent) . . . . . 2
- 1b. Otolith oblong or ovate to fusiform; rostrum elongate, tapered or rounded; dorsal pit in ostium absent . . . . . 3
- 2a. Dorsal margin of otolith approximately flat; cauda moderately wide, flares dorsally; dorsal area of otolith wide; dorsal depression very shallow . . . . .  
. . . . . *Rastrelliger kanagurta* 249.8
- 2b. Dorsal margin of otolith becomes strongly emarginate with growth; cauda narrow and elongate, strongly flexed and narrow at tip; dorsal area reduced and narrow; dorsal depression deep . . . . . *Scomber japonicus* 249.11
- 3a. Otoliths very angular, elongate triangular or angularly fusiform; posterior margin of otolith flat and strongly oblique; dorsal and ventral corners of posterior margin sharply angular; antirostrum short or minute . . . . . 4
- 3b. Otolith oblong or elongate, ovate to fusiform; posterior margin of otolith not angularly oblique and flat; dorsal and ventral corners of posterior margin not distinctly angular; antirostrum relatively large (may overhang excisura) . . . . . 6



- 4a. Dorsal margin of otolith slightly irregular, approximately flat, angled and raised posteriorly, otolith wedge-shaped; excisural notch very shallow; antirostrum minute; crista superior a low rounded ridge along entire sulcus; postero-ventral corner of otolith produced and rounded . . . . . *Gymnosarda unicolor* 249.6
- 4b. Dorsal margin of otolith approximately flat, raised posteriorly and crenate; excisural notch shallow; antirostrum small or short and broad; crista superior ridge-like to flexion, well developed elsewhere; postero-ventral corner of otolith sharply angled . . . . . 5
- 5a. Crista inferior well developed; lateral surface of otolith with strong sculpturing; cauda narrow, slightly flared posteriorly . . . . . *Sarda orientalis* 249.9
- 5b. Crista inferior a broad ridge; lateral surface of otolith with weak sculpturing; cauda wide, flared posteriorly . . . . . *Sarda sarda* 249.10
- 6a. Rostrum distinctly narrower than otolith height; rostrum elongate, tapered and narrow, may flare at tip; excisural notch not obscured by antirostrum . . . . . 7
- 6b. Rostrum not distinctly narrower than otolith height; rostrum not markedly tapered and narrow; excisural notch usually obscured by antirostrum . . . . . 9
- 7a. Rostrum elongate, flared and cup-like at tip, curved laterally; posterior margin of otolith flat and blunt; otolith elongate; cauda narrow, slightly flexed at tip . . . . . *Acanthocybium solandri* 249.1
- 7b. Rostrum tapered, tip pointed or sharply rounded; rostral tip does not curve laterally; posterior margin of otolith either flat and oblique or slightly rounded; cauda flexed and flared or slightly flared at flexion . . . . . 8
- 8a. Otolith elongate, fusiform and narrow; rostrum elongate and narrow; cauda narrow; ostium relatively narrow; ventral area with shallow groove in mid-area . . . . . *Scomberomorus commerson* 249.12
- 8b. Otolith stubbier, ovate to fusiform; rostrum moderately elongate and relatively broad; cauda wide; ventral area with deep groove under crista inferior . . . . . *Scomberomorus plurilineatus* 249.13
- 9a. Dorsal margin of otolith distinctly emarginate; postero-dorsal corner raised and angular; excisural notch not completely obscured by antirostrum . . . . . *Katsuwonus pelamis* 249.7
- 9b. Dorsal margin flat or slightly emarginate; postero-dorsal corner not angular and raised; excisural notch at least partially obscured by antirostrum . . . . . 10
- 10a. Rostrum flared and blunt; caudal tip reaches posterior margin of otolith, where wall is thin and lacy . . . . . *Euthynnus affinis* 249.4
- 10b. Rostrum not distinctly flared; caudal tip does not reach posterior margin of otolith: *Thunnus* spp. (*T. alalunga* 249.14, *T. albacares* 249.15, *T. maccoyii* 249.16, *T. t. thynnus* 249.18.) NOTE: Specific identification may be possible by comparison of otoliths to reference material and knowledge of the local fauna.

#### *Acanthocybium solandri*, SSF No. 249.1 PLATE 134

**DISTRIBUTION:** From Sodwana to Algoa Bay, rarely to Cape Point. A worldwide species of tropical and subtropical waters in all three major oceans and the Mediterranean Sea. Attains 210 cm FL, 83 kg.

**MATERIAL:** 2/2 (11.16, 12.2 mm OD, 1216, 1590 mm FL), PEM 1853, 6115; Natal and off Gonubie; Id. MJS.

**Otolith shape:** Ovate-fusiform. **Thickness:** Very thin. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Approximately flat, slightly emarginate; **sculpture, irregular.** **Ventral margin:** Slightly emarginate, serrate and irregular. **Posterior margin:** Flat and dentate to irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** No raised colliculi, sulcus deep, may be small nodules in ostium. **Pseudocolliculum:** Absent. **Ostium:** Narrow and elongate, covers most of rostrum, slightly cupped and flared at tip. **Cauda:** Straight, deep, undercutting ventral area and slightly flexed at tip. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:1, 1:0.9. **Collum:** Absent. **Crista superior:** Ridge-like from ostium to flexion, well developed at tip. **Crista inferior:** Poorly developed under ostium, short ridge under neck, well developed elsewhere. **Dorsal depression:** Narrow, elongate and deep, dorsal area reduced and narrow. **Ventral depression:** Deep groove runs along anterior cauda, area reduced and narrow. **Rostrum:** Elongate and slightly curved, tip sharply rounded, cupped and flared. **Antirostrum:** Moderate and pointed. **Excisura:** Wide, notch deep, angle acute.

#### *Euthynnus affinis*, SSF No. 249.4 PLATE 134

**DISTRIBUTION:** Cape St Francis or Mossel Bay to Delagoa Bay. Throughout warm waters of the Indo-West Pacific, stray in the eastern tropical Pacific. Attains c. 100 cm FL, at least 13 kg.

**MATERIAL:** 1/2 (5.0 mm OD, 545 mm FL, 570 mm TL), PEM 15561; Red Sea; Id. IN.

**Otolith shape:** Oblong. **Thickness:** Moderately thin. **Form:** - Mesial flat, - Lateral slightly concave. **Lateral surface:** High ridge under cauda and dorsal area. **Dorsal margin:** Flat; **sculpture, slightly irregular.** **Ventral margin:** Approximately flat, slightly irregular. **Posterior margin:** Rounded and irregular to lacy. **Sulcus acusticus:** Ostial, appears ostio-caudal as posterior wall erodes with growth, heterosulcoid. **Colliculum:** No raised colliculi. **Pseudocolliculum:** Absent. **Ostium:** Wide, flared and deep, extends across most of rostrum, dorsal rostral margin raised and angular. **Cauda:** Deep, flared and only dorsal margin slightly flexed, caudal tip ends at eroded posterior margin, slightly undercuts ventral area. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:1.3. **Collum:** Absent. **Crista superior:** Narrow, low ridge along the length of the sulcus. **Crista inferior:** Poor under anterior ostium, very well developed or low narrow ridge elsewhere, tip eroded. **Dorsal depression:** Narrow, moderately elongate and deep, almost groove-like, dorsal area very reduced and very narrow. **Ventral depression:** Absent, shallow short groove under neck, elongate shallow groove from ostium to mid-cauda. **Rostrum:** Large and broad, angularly flared, blunt and crenate. **Antirostrum:** Small and sharply rounded. **Excisura:** Wide, notch moderately deep, angle acute.

#### *Gymnosarda unicolor*, SSF No. 249.6 PLATE 135

**DISTRIBUTION:** Tropical Indo-West Pacific, distribution not continuous, taken off St Lucia. Attains 206 cm FL, 131 kg.

**MATERIAL:** 1/1 (6.0 mm OD, 530 mm FL, 605 mm TL), PEM 14564; Mauritius; Id. MJS.

**Otolith shape:** Oblong to triangular. **Thickness:** Thin. **Form:** - Mesial slightly convex, - Lateral concave. **Lateral surface:** Narrow anteriorly with groove at dorsal margin, postero-dorsally flared, wing-like. **Dorsal margin:** Flat, oblique, raised posteriorly; **sculpture, irregular.** **Ventral margin:** Sinuate, serrate or irregular. **Posterior margin:** Flat, oblique, slightly irregular and crenate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low and indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Narrow and elongate, covers most of rostrum. **Cauda:** Approximately straight ventral wall, deepens and flares dorsally at tip. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** 1:1.4. **Collum:** Absent, angular step up



to cauda. **Crista superior:** Narrow, simple and low ridge from ostium to tip. **Crista inferior:** Low rounded ridge along sulcus. **Dorsal depression:** Oval and moderately deep, area reduced and triangular. **Ventral depression:** Shallow groove runs parallel to crista, area reduced and narrow. **Rostrum:** Large and pointed. **Antirostrum:** Minute and pointed. **Excisura:** Wide, notch very shallow, angle wide.

#### *Katsuwonus pelamis*, SSF No. 249.7 PLATE 135

**DISTRIBUTION:** Common from Algoa Bay to Delagoa Bay, also from False Bay. Fairly abundant off Angola. Cosmopolitan in tropical and warm-temperate waters. Attains 108 cm FL, 34 kg. **MATERIAL:** 4/8 (4.75-6.18 mm OD, c. 500 - 620 mm FL), PEM 0805, 2661, 0989, 15680; Algoa Bay, Sodwana and off Cape Recife; Id. GJBR, MJS.

**Otolith shape:** Oblong. **Thickness:** Moderately thin. **Form:** - Mesial flat, - Lateral slightly concave. **Lateral surface:** Ridge close to dorsal margin. **Dorsal margin:** Approximately flat to strongly emarginate, raised posteriorly; **sculpture**, slightly irregular. **Ventral margin:** Flat to emarginate, slightly irregular or crenate. **Posterior margin:** Oblique to rounded and dentate to irregular. **Sulcus acusticus:** Ostial, may appear ostio-caudal as posterior wall erodes with growth, heterosulcoid. **Colliculum:** No raised colliculi. **Pseudocolliculum:** Absent. **Ostium:** Wide, flared and deep, extends across half of rostrum, may be pitted, dorsal rostral margin raised and irregular. **Cauda:** Very deep, flared and flexed posteriorly, undercuts ventral area, caudal tip ends at posterior margin. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:2, 1:2.1, 1:1.9, 1:2.1. **Collum:** Absent. **Crista superior:** Ridge-like along the length of the sulcus. **Crista inferior:** Narrow ridge along entire sulcus, tip may be eroded. **Dorsal depression:** Narrow, elongate and deep, almost groove-like, dorsal area very reduced and very narrow. **Ventral depression:** Absent, two grooves, one along mid-area, the other under cauda. **Rostrum:** Large, broad, angularly flared, tip sharply rounded. **Antirostrum:** Moderate and pointed, may become dorsally flexed. **Excisura:** Wide, notch moderately deep, angle acute.

#### *Rastrelliger kanagurta*, SSF No. 249.8 PLATE 135

**DISTRIBUTION:** Durban northwards to Red Sea; widespread in Indo-West Pacific. Has entered eastern Mediterranean Sea through the Suez Canal. Attains 35 cm FL.

**MATERIAL:** 1/1 (4.3 mm OD, 224 mm FL), PEM 5976; off Durban; Id. MJS.

**Otolith shape:** Approximately rectangular with pointed rostrum. **Thickness:** Moderate, rostrum thin. **Form:** - Mesial slightly convex, - Lateral concave. **Dorsal margin:** Approximately flat; **sculpture**, crenate and irregular. **Ventral margin:** Approximately flat and crenate. **Posterior margin:** Oblique and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, fused, low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Flares widely antero-dorsally, with cone-shaped hollow. **Cauda:** Flares and deepens posteriorly. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.2. **Collum:** Absent. **Crista superior:** Low ridge over ostium, well developed along cauda. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Elongate and shallow. **Ventral depression:** Absent, groove in mid-area from ostium to mid-cauda. **Rostrum:** Moderate and pointed. **Antirostrum:** Short, broad and sharply rounded. **Excisura:** Moderately wide, notch very shallow, angle wide.

#### *Sarda orientalis*, SSF No. 249.9 PLATE 135

**DISTRIBUTION:** Cape St Francis northwards to Natal coast; widespread in Indo-Pacific, but distribution not continuous. Attains 102 cm FL, at least 11 kg.

**MATERIAL:** 2/2 (4.25, 5.26 mm OD, 397, 424 mm FL), PEM 15466, 15465; off Noordhoek; Id. MJS.

**Otolith shape:** Angularly fusiform. **Thickness:** Thin. **Form:** - Mesial approximately flat, - Lateral slightly concave. **Lateral surface:** Slightly stronger ridges, grooves and sculpturing compared to *Sarda sarda*. **Dorsal margin:** Approximately flat, raised posteriorly; **sculpture**, crenate. **Ventral margin:** Flat to slightly emarginate and crenate or irregular. **Posterior margin:** Oblique and crenate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, indistinct and low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Elongate, covers most of rostrum. **Cauda:** Relatively narrow, flares very slightly dorsally and deepens posteriorly. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:0.6, 1:0.8. **Collum:** Absent. **Crista superior:** Ridge-like from ostium to flexion, well developed at tip. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Narrow, elongate and deep, area reduced and narrow. **Ventral depression:** Shallow, covering most of area. Ventral area reduced and narrow. **Rostrum:** Very elongate and sharply rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Very wide, notch shallow, angle acute.

#### *Sarda sarda*, SSF No. 249.10 PLATE 135

**DISTRIBUTION:** Abundant off Angola and northern Namibia. From Cape Point to Mossel Bay. Range extends, apparently to Port Alfred, possibly to Durban; tropical and temperate coasts of Atlantic Ocean, Mediterranean and Black seas. Attains 85 cm FL, 8 Kg.

**MATERIAL:** 3/4 (6.28-6.7 mm OD, 487-496 mm FL), PEM 1913, 0988, 6496; Mossel Bay and Algoa Bay; Id. MJS.

**Otolith shape:** Angularly fusiform. **Thickness:** Thin. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Lateral surface:** Bulge at the postero-dorsal corner. **Dorsal margin:** Approximately flat, raised posteriorly; **sculpture**, crenate. **Ventral margin:** Flat and crenate or irregular. **Posterior margin:** Oblique and crenate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, indistinct and low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Covers most of rostrum, elongate, wall deep at neck. **Cauda:** Flares dorsally and deepens posteriorly. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:0.6, 1:0.5, 0988 broken. **Collum:** Absent. **Crista superior:** Ridge-like from ostium to flexion, well developed at tip. **Crista inferior:** Broad and ridge-like from posterior ostium to caudal tip, poorly developed under anterior ostium. **Dorsal depression:** Oval and deep, area very reduced and narrow. **Ventral depression:** Elongate, entire ventral area flattened, reduced and narrow. **Rostrum:** Very elongate and pointed. **Antirostrum:** Short, broad and pointed or rounded. **Excisura:** Very wide, notch shallow, angle acute.

#### *Scomber japonicus*, SSF No. 249.11 PLATE 135

**DISTRIBUTION:** Common about the Cape, scarcer towards Natal. Cosmopolitan in warm waters. Attains 50 cm FL.

**MATERIAL:** 7/175 (2.4-6.7 mm OD, 137-415 mm TL), PEM 7310 (RUSI 28482), 7311 (RUSI 28482), 1458, 9412, 9406, 9250, 9246, [7687 (RUSI 34060)]; Cape south and west coast; Id. MJS, PCH.

**Otolith shape:** Rectangular with pointed rostrum. **Thickness:** Moderately thin, rostrum fragile (often damaged and lost in stomach contents). **Form:** - Mesial strongly convex, - Lateral strongly concave. **Dorsal margin:** Emarginate; **sculpture**, irregular.



**Ventral margin:** Flat and slightly irregular. **Posterior margin:** Flat, slightly oblique and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low, fused colliculi. **Pseudocolliculum:** Absent. **Ostium:** Flares widely, dorsal wall high, dorsal crista undercut. **Cauda:** Sinuous, deep and narrow, undercutting ventral area and strongly flexed at deep tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.6, 1:1.5, 1:1.4, 1:1.1, 1:1.3, 1:1.6, 1:0.9. **Collum:** Absent. **Crista superior:** Well developed over ostium, ridge-like from neck to caudal tip. **Crista inferior:** Poorly developed under ostium, ridge-like from neck to flexion, well developed at tip. **Dorsal depression:** Narrow, elongate and deep above cauda. **Ventral depression:** Narrow depression under cauda and a shallow groove occurs in mid-area. **Rostrum:** Small (c. 3 mm OD) becoming moderate and pointed (>c. 4 mm OD). **Antirostrum:** Very small, short and sharply rounded. **Excisura:** Moderately wide, notch shallow, angle wide.

***Scomberomorus commerson*, SSF No. 249.12  
PLATE 135**

**DISTRIBUTION:** Sometimes caught on Cape south coast, rarely to False Bay. Widespread throughout Red Sea and Indo-West Pacific. Attains 220 cm FL.

**MATERIAL:** 4/14 (12.38-16.5 mm OD, 877-1135 mm FL, 2697 not measured), PEM 2697, 1912, 2662, 8276; Sodwana and vicinity and Algoa Bay; Id. GRA, MJS.

**Otolith shape:** Fusiform, narrow and elongate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Lateral surface:** Low diagonal ridges to postero-dorsal and postero-ventral corners. **Dorsal margin:** Approximately flat and slightly emarginate; **sculpture**, slightly irregular. **Ventral margin:** Flat may be slightly emarginate, serrate and irregular. **Posterior margin:** Rounded or oblique, dentate and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, nodular anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Elongate, covers most of rostrum. **Cauda:** Straight, flexed, flared and deep posteriorly, it undercuts the ventral area. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:1.3, 1:1.5, 1:1.4, 1:1.1. **Collum:** Absent, may be a step to cauda. **Crista superior:** Ridge-like from ostium to flexion, well developed after flexion. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Narrow, deep and oval, area reduced and narrow. **Ventral depression:** May be shallow groove in mid-area. **Rostrum:** Elongate and sharply rounded or pointed. **Antirostrum:** Moderately elongate, sharply rounded or pointed, may obscure excisural notch beneath it. **Excisura:** Wide, notch moderately deep, angle acute.

***Scomberomorus plurilineatus*, SSF No. 249.13  
PLATE 136**

**DISTRIBUTION:** Confined to western Indian Ocean from Tsitsikamma to Kenya and west coast of Madagascar. Attains 120 cm FL.

**MATERIAL:** 2/5 (12.3, 14.06 mm OD, 8143 = 725 mm FL, 0470 FL not recorded), PEM 8143, 0470; St Lucia; Id. RvdE, MJS.

**Otolith shape:** Ovate to fusiform. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Approximately flat; **sculpture**, crenate and irregular. **Ventral margin:** Flat or slightly emarginate, dentate, crenate or irregular. **Posterior margin:** Rounded or flat and oblique, crenate, irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior colliculum nodular, posterior indistinct. **Pseudocolliculum:** Absent. **Ostium:** Slightly flared and elongate, covers most of rostrum. **Cauda:** Straight, deep, slightly flared and flexed near tip, undercutting ventral area. **Ostio-caudal differen-**

**tiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:1, 1:0.9. **Collum:** Absent, slight step up to cauda. **Crista superior:** Ridge-like from ostium to flexion, well developed after flexion. **Crista inferior:** Poorly developed under ostium, ridge-like under neck and cauda. **Dorsal depression:** Narrow, elongate and deep, area narrow. **Ventral depression:** Groove runs under ventral crista, area narrow. **Rostrum:** Moderately elongate and moderately broad, tip sharply rounded or pointed. **Antirostrum:** Moderate and pointed. **Excisura:** Wide, notch moderately deep, angle acute.

***Thunnus alalunga*, SSF No. 249.14 PLATE 136**

**DISTRIBUTION:** Oceanic, primarily from the western Cape region. Cosmopolitan between 45°-50°N and 30°-40°S. Attains 127 cm FL, common to 100 cm FL.

**MATERIAL:** 1/1 (12.58 mm OD, fish not measured), PEM 15467; locality unknown; Id. MJS.

**Otolith shape:** Oblong. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral concave. **Lateral surface:** Large keel under dorsal area, lobe near postero-dorsal corner. **Dorsal margin:** Slightly emarginate and slightly raised posteriorly; **sculpture**, serrate. **Ventral margin:** Approximately flat and slightly crenate. **Posterior margin:** Rounded dorsally, oblique, irregular or crenate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, colliculi indistinct and low. **Pseudocolliculum:** Absent. **Ostium:** Oval, flared ventrally, covers most of rostrum. **Cauda:** Deep V-shaped flared dorsal wall and slightly flexed at tip. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:1.8. **Collum:** Absent. **Crista superior:** Broad ridge from ostium to flexion, well developed thereafter. **Crista inferior:** Broad ridge from ostium to flexion, well developed under flexion. **Dorsal depression:** Slit-like and deep, dorsal area very narrow. **Ventral depression:** Shallow, narrow groove from ostium to flexion, ventral area reduced and narrow. **Rostrum:** Large, moderately broad and pointed. **Antirostrum:** Moderate and pointed, overhangs excisura. **Excisura:** Wide, notch moderate, angle acute (observed by antirostrum in electron micrograph).

***Thunnus albacares*, SSF No. 249.15 PLATE 136**

**DISTRIBUTION:** Abundant off Angola and southern African coast. Worldwide in tropical and subtropical seas. Attains 200+ cm FL.

**MATERIAL:** 4/15 (8.8-11.12 mm OD, 605-c. 810 mm FL), PEM 7466, 7470, 0858, 2663; Sodwana Bay and off Algoa Bay; Id. GJBR, MJS.

**Otolith shape:** Oblong. **Thickness:** Moderately thin. **Form:** - Mesial convex, - Lateral concave. **Lateral surface:** Large keel under dorsal area. **Dorsal margin:** Flat or slightly emarginate and raised posteriorly; **sculpture**, irregular. **Ventral margin:** Approximately flat, serrate and slightly irregular. **Posterior margin:** Rounded or flat and oblique, serrate or crenate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Colliculi not raised or may have indistinct anterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Oval, flared ventrally, covers most of rostrum. **Cauda:** Deep V-shaped flared dorsal wall and slightly flexed at tip. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:1.6, 1:1.6, 1:2.2, 1:1.8. **Collum:** Absent. **Crista superior:** Ridge-like from ostium to flexion, well developed thereafter. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Slit-like and deep, dorsal area very narrow. **Ventral depression:** Shallow, narrow groove runs along mid-area, ventral area reduced and narrow. **Rostrum:** Large, moderately broad and sharply rounded. **Antirostrum:** Moderate and pointed, overhangs excisura. **Excisura:** Wide,



notch moderate, angle acute (obscured by antirostrum in electron micrograph).

***Thunnus maccoyii*, SSF No. 249.16 PLATE 136**

**DISTRIBUTION:** Off southern Africa only from off the Cape region during winter. Probably found throughout the southern oceans south of 30°S. Attains at least 225 cm FL.

**MATERIAL:** 4/8 (6.8-21.4 mm OD, 400-1860 mm FL), PEM 15065, 15068, 15070, 15064; off Tasmania; Id. C. Procter.

**Otolith shape:** Oblong to fusiform. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Lateral surface:** Keel under postero-dorsal corner, thickens with growth. **Dorsal margin:** Approximately flat or slightly rounded; **sculpture**, irregular. **Ventral margin:** Approximately flat or slightly emarginate and slightly irregular. **Posterior margin:** Flat and oblique or slightly rounded, pointed ventrally and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph; low, nodular anterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Oval, cupped, rostral edge slightly raised (and very fragile); covers most of rostrum. **Cauda:** Slightly sinuous, flared dorsally and deepening posteriorly, tip pointed. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:1.3, 1:1.3, 1:1.5, 1:1.8. **Collum:** Absent. **Crista superior:** Well developed or ridge-like from ostium to flexion, well developed at tip. **Crista inferior:** Poorly developed under ostium, well developed or ridge-like thereafter. **Dorsal depression:** Slit-like over sulcus, dorsal area reduced and narrow. **Ventral depression:** Absent, deep groove runs along mid-area, deepens with growth. **Rostrum:** Large and broad, tip pointed or rounded. **Antirostrum:** Moderate and pointed, overhangs excisural notch. **Excisura:** Wide, notch deep, angle acute.

***Thunnus thynnus thynnus*, SSF No. 249.18 PLATE 136**

**DISTRIBUTION:** In the Agulhas Bank and False Bay area in summer. Attains more than 3 m FL.

**MATERIAL:** 1/1 (9.64 mm OD, fish not measured), PEM 0981; locality uncertain, possibly south Pacific; Id. JEF.

**Otolith shape:** Oblong. **Thickness:** Moderately thin. **Form:** - Mesial convex, - Lateral concave. **Lateral surface:** Keel under dorso-posterior corner. **Dorsal margin:** Flat; **sculpture**, slightly irregular. **Ventral margin:** Approximately flat, slightly sinuate and slightly irregular. **Posterior margin:** Flat and oblique, ventral corner pointed and slightly crenate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low anterior nodular colliculum. **Pseudocolliculum:** Absent. **Ostium:** Oval, covers nearly half of rostrum. **Cauda:** Slightly sinuate to straight, slightly dorsally flared and deepening posteriorly. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:1.4. **Collum:** Absent. **Crista superior:** Well developed to ridge-like along entire sulcus. **Crista inferior:** Poorly developed under ostium, ridge-like from neck to caudal tip. **Dorsal depression:** Groove-like in mid-area, area reduced and narrow. **Ventral depression:** Absent, groove in mid-area from neck to flexion. **Rostrum:** Large, broad and rounded. **Antirostrum:** Moderate and pointed, overhangs excisural notch. **Excisura:** Wide, notch moderate, angle acute.

**XIPHIIDAE Nelson No. 415**

**Family characteristics:** One species described. Otoliths minute in relation to fish size, up to at least 2.9. mm OD. Otolith shape ovate-fusiform and axe-shaped, very thin and delicate. Heterosulcoid, sulcus shallow and very poorly defined. Ostial or ostio-caudal opening, ostium covers most of elongate rostrum. Cauda poorly defined, slightly flexed at tip, crista superior extremely poorly developed. Heteromorph with very indistinct colliculi.

***Xiphias gladius*, SSF No. 251.1 PLATE 136**

**DISTRIBUTION:** Found in all oceans. In this area found between Namibia and Natal. Attains 5 m and well over 500 kg.

**MATERIAL:** 2/2 (c. 2.1-2.9 mm OD, fish size not recorded, c. 3-4m), PEM 1966, 2087; off Natal and south of Algoa Bay; Id. RvdE, GJBR.

**Otolith shape:** Ovate-fusiform, axe-shaped. **Thickness:** Thin and delicate. **Form:** - Mesial strongly concave, - Lateral convex. **Dorsal margin:** Raised, rounded; **sculpture**, crenate. **Ventral margin:** Approximately flat, serrate and irregular. **Posterior margin:** Slightly rounded, may be notched ventrally and serrate. **Sulcus acusticus:** Ostial, may become ostio-caudal, heterosulcoid. **Colliculum:** Heteromorph, very indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Covers most of rostrum, floor smooth. **Cauda:** Short, wide and rounded, may have pits or grooves to margin, very poorly defined and shallow. **Ostio-caudal differentiation:** Slightly ventrally constricted. **Ostium/cauda:** 1:0.9, 1966 broken. **Collum:** Absent. **Crista superior:** Extremely poorly developed. **Crista inferior:** Poorly developed. **Dorsal depression:** Absent. **Ventral depression:** Absent, area irregular. **Rostrum:** Elongate and pointed. **Antirostrum:** Large, very broad. **Excisura:** Very wide, notch moderately deep, angle wide.

**ISTIOPHORIDAE Nelson No. 417**

**Family characteristics:** One species described. Otoliths minute and based on the single specimen available, up to at least 4 mm OD, shaped like an hour-glass or anvil. Archaeosulcoid, sulcus deep, no raised colliculi.

***Makaira indica*, SSF No. 252.2 PLATE 136**

**DISTRIBUTION:** Primarily an Indo-Pacific species but fairly common off the Cape of Good Hope. Attains 4.5 m, 700 kg.

**MATERIAL:** 1/1 (3.4 mm OD, 3430 mm TL), PEM 0726; off Cape Recife; Id. GJBR.

**Otolith shape:** Approximately hour-glass or anvil-like. **Thickness:** Thin and delicate. **Form:** - Mesial strongly concave, - Lateral convex. **Dorsal margin:** Raised, slightly rounded; **sculpture**, serrate. **Ventral margin:** Approximately flat and crenate. **Posterior margin:** Notched and slightly irregular. **Sulcus acusticus:** Ostio-caudal, archaeosulcoid. **Colliculum:** No raised colliculi. **Pseudocolliculum:** Absent. **Ostium and cauda:** Undifferentiated, sulcus a deep V-shaped depression in mid-otolith. **Ostio-caudal differentiation:** Absent. **Collum:** Absent. **Crista superior:** Well developed. **Crista inferior:** Low and uneven ridge along sulcus. **Dorsal depression:** Absent, dorsal area reduced. **Ventral depression:** Absent, very shallow groove in mid-area, ventral area reduced. **Rostrum:** Large and pointed. **Antirostrum:** Small, broad and rounded. **Excisura:** Wide, notch moderate, angle wide.

**NOMEIDAE Nelson No. 420**

**Family characteristics:** Seven species described. Otoliths of some species similar to Stromateidae. Otoliths ovate, oblong or oval-ovate up to at least 21 mm OD. Heterosulcoid with ostial openings. Ostium approximately oval, lies on rostrum, cauda straight, may be flexed or slightly flexed at tip. Heteromorph with low or indistinct colliculi. Several of the species are represented only by juveniles and this should be borne in mind when using the key and descriptions.

**Key**

- 1a. Cauda straight, not flexed or slightly flared and very slightly flexed near tip . . . . . 2
- 1b. Cauda distinctly flexed . . . . . 3
- 2a. Otolith broad; antirostrum large; excisural notch distinct; caudal tip bluntly rounded but poorly defined . . . . . *Ariomma indica* 255.1



- 2b. Otolith relatively narrow; antirostrum small; excisural notch narrow; caudal tip slightly flexed, may taper to tip . . . . . *Cubiceps caeruleus* 255.4
- 3a. Cauda narrow; dorsal margin of otolith flat and slightly crenate or slightly irregular; ostium narrow; rostrum relatively elongate; antirostrum minute . . . . . *Cubiceps baxteri* 255.3
- 3b. Cauda not narrow; dorsal margin raised, rounded or flat and crenate; ostium relatively wide, not elongate; antirostrum small to moderate . . . . . 4
- 4a. Ostium angled antero-dorsally; cauda sharply flexed with pointed tip; ventral margin of otolith distinctly rounded . . . . . *Psenes whiteleggii* 255.12
- 4b. Ostium horizontal; cauda flexed or slightly flexed with rounded tip; ventral margin not distinctly rounded. . . . . 5
- 5a. Posterior margin of caudal tip poorly defined and rounded; antirostrum large and broad . . . . . *Nomeus gronovii* 255.7
- 5b. Posterior margin of caudal tip well defined, flexed and rounded; antirostrum small . . . . . 6
- 6a. Caudal tip flared and flexed in juveniles; dorsal margin of otolith flat, becoming raised with growth; excisural notch shallow . . . . . *Cubiceps capensis* 255.5
- 6b. Caudal tip flexed, not flared in juveniles; dorsal margin of otolith flat and slightly crenate in juveniles; excisural notch distinct . . . . . *Cubiceps pauciradiatus* 255.6

***Ariomma indica*, SSF No. 255.1 PLATE 136**

**DISTRIBUTION:** Mossel Bay eastwards to southern Japan. Attains 25 cm.

**MATERIAL:** 5/18 (1.55-4.25 mm OD, 51-141 mm TL), PEM 5108, 4543, 4336, 5107, 4542; Cape south coast; Id. MJS, PCH.

**Otolith shape:** Ovate. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Slightly rounded; **sculpture**, lobed or crenate. **Ventral margin:** Slightly rounded and crenate. **Posterior margin:** Slightly rounded and crenate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Flared, lies mainly on rostrum. **Cauda:** Straight, slightly flared posteriorly. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.2, 1:1.1, 1:1.4, 1:1.2, 1:1.1. **Collum:** Absent, slight step up to cauda. **Crista superior:** Well developed above ostium, low ridge from neck to flexion, poorly developed at tip. **Crista inferior:** Poorly developed under ostium and caudal tip, well developed along cauda. **Dorsal depression:** Oval and shallow. **Ventral depression:** Absent. **Rostrum:** Large, broad, pointed or sharply rounded. **Antirostrum:** Moderate and pointed. **Excisura:** Moderately wide, notch moderate, angle varies.

***Cubiceps baxteri*, SSF No. 255.3 PLATE 137**

**DISTRIBUTION:** Atlantic, Pacific and Indian Oceans. May exceed 100 cm.

**MATERIAL:** 1/1 (7.1 mm OD, 195 mm TL), PEM 14975 (RUSI 35584); Cape south coast; Id. MJS, PCH.

**Otolith shape:** Ovate. **Thickness:** Very thin. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Flat; **sculpture**, slightly crenate or slightly irregular. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Rounded and lobed. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Oval and elongate, opens on to dorsal margin of rostrum. **Cauda:** Straight, narrow, flexed and deep posteriorly, tip poorly defined. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:1.3. **Collum:** Absent. **Crista superi-**

**or:** Well developed over ostium, a low ridge from neck to flexion, poorly developed thereafter. **Crista inferior:** Poorly developed under ostium, well developed or a low ridge under cauda. **Dorsal depression:** Shallow and oval. **Ventral depression:** Absent. **Rostrum:** Large, broad and sharply rounded. **Antirostrum:** Minute and rounded. **Excisura:** Moderate, notch very shallow, angle wide.

***Cubiceps caeruleus*, SSF No. 255.4 PLATE 137**

**DISTRIBUTION:** Southern Atlantic and Pacific Oceans. Up to at least 25 cm.

**MATERIAL:** 4/35 (4.7-5.8 mm OD, 170-201 mm TL), PEM 13613, 14156 (RUSI 28485), 13942, 13945, [14157 (RUSI 34075), 15356 & 15357 (both RUSI 38219)]; Cape west coast; Id. MJS, PCH.

**Otolith shape:** Oblong-ovate. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Slightly rounded; **sculpture**, crenate or lobed. **Ventral margin:** Slightly rounded, crenate or lobed. **Posterior margin:** Rounded, crenate to dentate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low anterior colliculum, posterior indistinct. **Pseudocolliculum:** Absent. **Ostium:** Approximately oval, dorsal rostral margin irregular. **Cauda:** Straight, slightly flexed at poorly defined tip. **Ostio-caudal differentiation:** Slightly curved dorso-ventrally. **Ostium/cauda:** 1:1, 1:0.7, 1:0.8, 1:0.7. **Collum:** Absent, low step present. **Crista superior:** Well developed over ostium, low ridge from neck to flexion, poorly developed at tip. **Crista inferior:** Moderate to poorly developed below ostium, low ridge under cauda. **Dorsal depression:** Shallow and oval. **Ventral depression:** Very shallow under cauda. **Rostrum:** Large, broad and sharply rounded. **Antirostrum:** Very small and sharply rounded. **Excisura:** Moderate, notch shallow, angle acute.

***Cubiceps capensis*, SSF No. 255.5 PLATE 137**

**DISTRIBUTION:** Probably circumglobal in southern hemisphere. Attains 90 cm.

**MATERIAL:** 2/2 (4.85, c. 21.2 mm OD, 130, 515 mm TL), 1533H, PEM 10362; Cape Recife and Agulhas Bank; Id. MJS, TH, PCH.

**Otolith shape:** Oblong. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Flat becoming raised (c. 20 mm OD); **sculpture**, crenate becoming irregular. **Ventral margin:** Slightly rounded and crenate or slightly irregular. **Posterior margin:** Rounded and crenate or slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Oval, flares slightly. **Cauda:** Narrow, flexed, rounded and poorly defined at tip. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:1.1, 1:1.2. **Collum:** Absent, slight step present. **Crista superior:** Poorly developed over ostium and caudal tip, low ridge from neck to flexion. **Crista inferior:** Poorly developed under ostium, low ridge from neck to flexion, well developed after flexion. **Dorsal depression:** Very shallow and elongate. **Ventral depression:** Absent. **Rostrum:** Large, broad and rounded or sharply rounded. **Antirostrum:** Small and pointed or rounded. **Excisura:** Moderate, notch shallow, angle varied.

***Cubiceps pauciradiatus*, SSF No. 255.6 PLATE 137**

**DISTRIBUTION:** Atlantic, Pacific and Indian Oceans. Attains 20 cm.

**MATERIAL:** 1/3 (5.72 mm OD, c. 106 mm TL), PEM 0948; tropical eastern Pacific; Id. JEF.

**Otolith shape:** Oblong-ovate. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Flat; **sculpture**, crenate. **Ventral margin:** Slightly



rounded and crenate. **Posterior margin:** Rounded and crenate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, very low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Flared and dorsally flexed, approximately oval. **Cauda:** Straight, moderately wide, flexed at tip and ending well short of posterior margin but close to ventral margin. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:1.1. **Collum:** Absent, step up to cauda. **Crista superior:** Well developed above ostium, low ridge from neck to flexion, poorly defined tip. **Crista inferior:** Very poorly developed or absent under ostium, well developed under cauda. **Dorsal depression:** Elongate and shallow. **Ventral depression:** Absent. **Rostrum:** Large and rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Moderate, notch shallow, angle varied.

#### *Nomeus gronovii*, SSF No. 255.7 PLATE 137

**DISTRIBUTION:** Circumglobal in warm waters. Attains 39 cm. **MATERIAL:** 1/1 (2.3 mm OD, 68 mm TL), PEM 3936; Sedgefield; Id. PCH.

**Otolith shape:** Oval-ovate. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Flat; **sculpture**, crenate. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Sharply rounded and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low, indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Approximately oval, lies mainly on rostrum. **Cauda:** Mainly straight, slightly flexed and poorly defined tip. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:1.2. **Collum:** Absent. **Crista superior:** Well developed along sulcus, very poorly developed at tip. **Crista inferior:** Poorly developed under ostium and caudal tip, well developed under cauda. **Dorsal depression:** Absent. **Ventral depression:** Absent. **Rostrum:** Large, broad and sharply rounded. **Antirostrum:** Large and sharply rounded. **Excisura:** Moderate, notch moderate, angle acute.

#### *Psenes whiteleggii*, SSF No. 255.12 PLATE 137

**DISTRIBUTION:** Indian Ocean and Australia. Attains 20 cm. **MATERIAL:** 4/20 (5.7-6.9 mm OD, 147-180 mm TL), PEM 6140, 12794 (RUSI 28486), 6148, 12898 (RUSI 28483); Mozambique, Durban and Cape south coast; Id. MJS, PCH.

**Otolith shape:** Oval-ovate. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Flat; **sculpture**, slightly lobed or crenate. **Ventral margin:** Rounded and crenate or slightly irregular. **Posterior margin:** Rounded and crenate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Narrow, oval and slightly dorsally flexed. **Cauda:** Straight, flexed and deepening at posterior tip. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:1, 1:0.9, 1:1.1, 1:1.1. **Collum:** Absent, slight step to cauda. **Crista superior:** Well developed over ostium, ridge-like from neck to flexion, poorly developed at tip. **Crista inferior:** Poorly developed under ostium, well developed below cauda. **Dorsal depression:** Oval and shallow. **Ventral depression:** Absent. **Rostrum:** Large, broad and sharply rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Moderate, notch moderate, angle acute.

### TETRAGONURIDAE Nelson No. 422

**Family characteristics:** Based on a single species; oval-ovate up to at least 4.4 mm OD, with raised and/or rounded dorsal margin. Heterosulcoid sulcus with ostial opening, cauda straight but tip extremely poorly defined. Heteromorph, colliculi very indistinct.

Rostrum large and pointed, antirostrum small. Crista superior distinctly ridge-like.

#### *Tetragonurus cuvieri*, SSF No. 256.2 PLATE 137

**DISTRIBUTION:** Natal; also western Mediterranean, eastern Atlantic and Pacific oceans. Attains 70 cm.

**MATERIAL:** 2/3 (3.4, 4.4 mm OD, 382, 475 mm TL), PEM 14752, 13295; Cape west coast, lodged in SAM.

**Otolith shape:** Oval-ovate. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral slightly convex. **Dorsal margin:** Rounded, raised; **sculpture**, crenate or lobed. **Ventral margin:** Slightly rounded and crenate or irregular. **Posterior margin:** Rounded, crenate or lobed. **Sulcus acusticus:** Ostial, may appear ostio-caudal, heterosulcoid. **Colliculum:** Heteromorph, very indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Approximately oval, lies mainly on rostrum, flared slightly dorsally. **Cauda:** Straight, tip poorly very defined. **Ostio-caudal differentiation:** Slightly dorsally constricted. **Ostium/cauda:** 1:1.1, 1:1.1. **Collum:** Absent. **Crista superior:** Ridge-like from ostium along cauda, absent at tip. **Crista inferior:** Absent or poorly developed under ostium, well developed or low ridge under cauda. **Dorsal depression:** Oval and shallow. **Ventral depression:** Absent. **Rostrum:** Large and pointed. **Antirostrum:** Minute and sharply rounded. **Excisura:** Moderately wide, notch very shallow, angle wide.

### STROMATEIDAE Nelson No. 423

**Family characteristics:** Six species described. Some species similar to Nomeidae. Otolith shape varies considerably; oblong, ovate, oval-ovate, semi-circular or rounded-ovate to fusiform, up to 32.5 mm OD. Some are thin and wafer-like, others moderately thick. Heterosulcoid with ostial openings, rarely may appear ostio-caudal or mesial. Ostium and cauda shape varies considerably, as do the colliculi although all are heteromorph. The diversity of form suggests the family is in need of revision.

#### Key

- 1a. Otolith semicircular; sulcus angled at 45° . . . . . *Schedophilus huttoni* 254.6
- 1b. Otolith oblong, oval-ovate or fusiform; sulcus approximately horizontal . . . . . 2
- 2a. Otolith rounded-ovate or ovate to fusiform; antirostrum broad or moderate; cauda moderately wide; excisura not slit-like . . . . . 3
- 2b. Otolith approximately oblong; antirostrum usually narrow or minute; cauda narrow; excisura relatively narrow, notch may be slit-like . . . . . 4
- 3a. Rostrum broad and rounded; dorsal margin of rostrum very irregular; dorsal margin of otolith rounded or raised; posterior margin of otolith rounded; antirostrum short and broad; excisural notch shallow . . . . . *Hyperoglyphe moselii* 254.3
- 3b. Rostrum moderately large, becoming distinctly elongate; dorsal margin of rostrum slightly irregular; dorsal margin of otolith slightly rounded; posterior margin of otolith notched or sharply rounded; antirostrum moderate; excisural notch moderate . . . *Stromateus fiatola* 254.10
- 4a. Ostium elongate and angled; cauda short and straight; otolith wafer-like, thin . . . . . *Centrolophus niger* 254.1
- 4b. Ostium moderately long; cauda straight and elongate, flexed at tip; otolith not thin and wafer-like . . . . . 5
- 5a. Cauda very elongate and very narrow; ostium narrow and elongate; dorsal and ventral margins of otolith flat to slightly rounded and relatively narrow and elongate; otolith elongate . . . . . *Hyperoglyphe antarctica* 254.2



- 5b. Cauda moderately elongate, moderately wide; ostium short and wide; dorsal and ventral margins of otolith slightly rounded; otolith relatively broad . . . . .  
 . . . . . *Schedophilus ovalis* 254.8

***Centrolophus niger*, SSF No. 254.1 PLATE 137**

**DISTRIBUTION:** Temperate waters of Australia, New Zealand, South America and South Africa, also north Atlantic and Mediterranean. Attains 120 cm.

**MATERIAL:** 4/7 (17.7-32.5 mm OD, 447-980 mm TL), PEM 14200, 14592, 14588, 14591; off Namibia; Id. MJS.

**Otolith shape:** Oblong. **Thickness:** Thin, wafer-like. **Form:** - Mesial flat, - Lateral flat. **Dorsal margin:** Slightly rounded, slightly raised posteriorly; **sculpture**, crenate. **Ventral margin:** Slightly rounded and crenate. **Posterior margin:** Oblique, sharply rounded or pointed and crenate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, very low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Large, oval, antero-dorsally angled, opens narrowly to dorsal margin of rostrum. **Cauda:** Short, straight and narrow with pointed tip. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:0.8, 1:0.7, 1:0.7, 1:0.8. **Collum:** Absent. **Crista superior:** Well developed along entire sulcus. **Crista inferior:** Poorly developed along entire sulcus. **Dorsal depression:** Large, oval and very shallow. **Ventral depression:** Absent. **Rostrum:** Large, very broad, rounded or angular. **Antirostrum:** Moderate or small and pointed. **Excisura:** Moderate, notch shallow to moderate, angle acute.

***Hyperoglyphe antarctica*, SSF No. 254.2 PLATE 138**

**DISTRIBUTION:** Temperate waters; islands of south Atlantic and southern Indian Oceans; New Zealand, southern Australia and South Africa. Attains 110 cm.

**MATERIAL:** 2/2 (20.3, 28.7 mm OD, 710, 1040 mm TL), PEM 7884, 7883; Gough Is.; Id. PAH.

**Otolith shape:** Oblong. **Thickness:** Moderate, thicker than previous species. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Flat to slightly rounded; **sculpture**, crenate or irregular. **Ventral margin:** Flat to slightly rounded, crenate or irregular. **Posterior margin:** Rounded, crenate or irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Oval, narrow and elongate, lies mainly on rostrum. **Cauda:** Long and narrow, elongate, straight then flexed and deepening at tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.8, 1:2. **Collum:** Absent. **Crista superior:** Well developed over ostium and after flexion, low and narrow ridge from neck to flexion. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Oval and very shallow. **Ventral depression:** Absent. **Rostrum:** Large, broad and sharply rounded. **Antirostrum:** Moderate, pointed or rounded. **Excisura:** Moderate, notch moderate, angle acute.

***Hyperoglyphe moselii*, SSF No. 254.3 PLATE 138**

**DISTRIBUTION:** Gulf of Guinea to South Africa, St Helena, from 270m or more. Attains 100 cm.

**MATERIAL:** 4/6 (8.5-11.1 mm OD, 324-358 mm TL, 12138 not measured), PEM 14759, 14692, 14758, 12138; west coast; Id. PC, MJS.

**Otolith shape:** Oval-ovate. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Slightly rounded; **sculpture**, crenate or irregular. **Ventral margin:** Rounded and crenate. **Posterior margin:** Rounded, crenate or irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, low colliculi. **Pseudocolliculum:** Absent. **Ostium:** Oval, fairly long and narrow, lies on rostrum, rugose,

rostral dorsal margin irregular. **Cauda:** Straight, narrow and slightly flexed at tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.6, 1:1.3, 1:1.5, 1:1.1. **Collum:** Absent, may be a step up to cauda. **Crista superior:** Well developed over ostium, low ridge from neck to flexion, poorly developed at tip. **Crista inferior:** Poorly developed under ostium, low ridge or well developed under cauda. **Dorsal depression:** Oval and shallow. **Ventral depression:** Shallow lunate depression in mid-area may be present. **Rostrum:** Large, broad and sharply rounded. **Antirostrum:** Moderate or minute, broad and rounded. **Excisura:** Moderate, notch moderate or shallow, angle varies.

***Schedophilus huttoni*, SSF No. 254.6 PLATE 138**

**DISTRIBUTION:** Circumglobal in Southern Ocean; off Namibia. Attains 90 cm.

**MATERIAL:** 5/18 (15.3-17.1 mm OD, 551-771 mm TL), PEM 14779, 14600, 14603, 14599, 14597; off Namibia; Id. MJS.

**Otolith shape:** Semicircular. **Thickness:** Thin and wafer-like. **Form:** - Mesial flat, - Lateral flat. **Lateral surface:** Radiating ridges in herring-bone pattern. **Dorsal margin:** Flat with slight indentation and fold above cauda; **sculpture**, slightly irregular. **Ventral margin:** Well rounded with minute crenations. **Posterior margin:** Sharply rounded with minute crenations. **Sulcus acusticus:** Ostial, may appear mesial as cristae poorly developed, heterosulcoid. **Colliculum:** Heteromorph, very low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Narrow and elongate, poorly defined, penetrates dorsal margin, sulcus angled at about 45 degrees. **Cauda:** Straight, narrow and short, tip pointed. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:0.7, 1:0.6, 1:0.5, 1:0.7, 1:0.8. **Collum:** Absent. **Crista superior:** Very poor or absent over ostium, narrow ridge above cauda. **Crista inferior:** Very poor or absent under ostium, narrow ridge below cauda. **Dorsal depression:** Very shallow. **Ventral depression:** Absent. **Rostrum:** Short, very broad and sharply rounded. **Antirostrum:** Minute and pointed. **Excisura:** Narrow, notch very shallow, angle acute.

***Schedophilus ovalis*, SSF No. 254.8 PLATE 138**

**DISTRIBUTION:** Northwest Africa, Atlantic Ids, Mediterranean, South Africa, Australia and Pacific. Attains 100 cm.

**MATERIAL:** 2/2 (14.32, 19.82 mm OD, c. 500, 820 mm TL), 1616H, PEM 15487; off East London; Id. PCH.

**Otolith shape:** Oblong-ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded; **sculpture**, serrate, dentate or crenate. **Ventral margin:** Slightly rounded and crenate. **Posterior margin:** Sharply rounded, crenate or dentate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior distinct, posterior colliculum low. **Pseudocolliculum:** Absent. **Ostium:** Oval and narrow. **Cauda:** Straight for most of its length, deeper and flexed posteriorly. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.7, 1:2.1. **Collum:** Absent. **Crista superior:** Well developed over ostium, ridge-like from neck to flexion, poorly developed at tip. **Crista inferior:** Poorly developed at ostium, well developed under cauda. **Dorsal depression:** Very shallow and oval. **Ventral depression:** Absent. **Rostrum:** Large, broad and sharply rounded. **Antirostrum:** Small and pointed. **Excisura:** Moderately wide, notch moderately shallow, angle acute.

***Stromateus fiatola*, SSF No. 254.10 PLATE 138**

**DISTRIBUTION:** Eastern Atlantic and Mediterranean, round the Cape to Natal. Attains 50 cm.

**MATERIAL:** 7/55 (3.16-7.7 mm OD, 104-335 mm TL), PEM 4275, 4278 (RUSI 13246), 4509 (RUSI 12812), 12461, 4653 (RUSI 14953), 4982, 11739, [4272 & 4274 (both RUSI 13246),



4652 & 4696 (both 14953), 4287 & 4288 (both RUSI 12769]; Natal and Cape south coast; Id. PCH, MJS.

**Otolith shape:** Rounded-ovate (<4 mm OD), becoming fusiform with elongate rostrum with growth (c. 7 mm OD). **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Lateral surface:** V-shaped depression under anterior sulcus. **Dorsal margin:** Slightly rounded; **sculpture**, crenate or irregular. **Ventral margin:** Slightly rounded or flat and crenate or serrate. **Posterior margin:** Oblique or sharply rounded, dentate or irregular and may be notched. **Sulcus acusticus:** Ostial, may appear ostio-caudal as a notch from posterior margin may reach caudal tip, heterosulcoid. **Colliculum:** Heteromorph, low anterior, indistinct posterior colliculum. **Pseudocolliculum:** Absent. **Ostium:** Oval or with bulbous ventral wall becoming elongate and narrow (c. 7 mm OD). **Cauda:** Straight and slightly flexed near tip. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.4, 1:1.1, 1:1.5, 1:1.4, 1:1.5, 1:1.4, 1:1. **Collum:** Absent. **Crista superior:** Well developed over ostium, ridge-like from neck to flexion, poorly developed at tip. **Crista inferior:** Poorly developed below ostium, well developed below cauda. **Dorsal depression:** Oval and shallow. **Ventral depression:** Absent, may be a groove in the ventral area. **Rostrum:** Broad and sharply rounded, becoming elongate, narrow and pointed with growth. **Antirostrum:** Moderate or large, broad and pointed or sharply rounded. **Excisura:** Moderately wide becoming very wide, notch moderate, angle acute.

## ORDER PLEURONECTIFORMES

### PSETTODIDAE Nelson No. 432

**Family characteristics:** Description based on two species. Otoliths angularly ovate or elongate ovate, up to at least 16 mm OD. Heterosulcoid with ostial openings. Ostium triangular and indented, cauda flexed. Depressions in dorsal and ventral areas distinct. Heteromorph, anterior colliculum indented, posterior colliculum indistinct.

#### Key

- 1a. Otolith angular and broad; dorsal margin of otolith emarginate; cauda straight, flexed at tip; sulcus in midline of otolith . . . . . *Psettodes erumei* 257.1
- 1b. Otolith elongate and relatively narrow; dorsal margin of otolith slightly rounded; cauda flexed along its length; sulcus dorsal to midline; caudal tip ends close to posterior margin . . . . . *Psettodes* sp. 257.-

#### *Psettodes erumei*, SSF No. 257.1 PLATE 138

**DISTRIBUTION:** Red Sea and Indo-West Pacific from Delagoa Bay to Australia and Japan. Attains 60 cm.

**MATERIAL:** 2/2 (13.94, 16.44 mm OD, 410, 463 mm TL), PEM 15475 (RUSI 40617), 0225; Tugela Bank and off Madagascar; Id. GJBR; PCH, MJS.

**Otolith shape:** Angularly ovate. **Thickness:** Moderately thick. **Form:** - Mesial approximately flat, - Lateral slightly concave. **Dorsal margin:** Slightly emarginate; **sculpture**, notched and slightly irregular. **Ventral margin:** Slightly rounded, notched and very irregular. **Posterior margin:** Oblique and irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior depressed and triangular, posterior depressed and indistinct. **Pseudocolliculum:** Absent. **Ostium:** Approximately triangular and deeply indented with low rim on anterior edged. **Cauda:** Straight, flexed and deepening at tip, shallower than ostium. **Ostio-caudal differentiation:** Dorsally constricted. **Ostium/cauda:** 1:1.3, 1:1.2. **Collum:** Absent, step up to cauda. **Crista superior:** Ridge-like and irregular from ostium to cauda. **Crista inferior:** Ridge-like at neck and very broad, well developed elsewhere. **Dorsal depression:** Approximately oval, broader pos-

teriorly, may penetrate sulcus at mid-cauda. **Ventral depression:** Elongate and very deep, entire area depressed. **Rostrum:** Large, broad and pointed. **Antirostrum:** Minute and rounded. **Excisura:** Wide, notch very shallow, angle wide.

#### *Psettodes* sp. (possibly *belcheri*), SSF No. 257.-

#### PLATE 138

**NOTE:** Specific identification of this otolith is dubious as the fish is no longer preserved. Judging from distribution of *P. belcheri*, it is more likely to be this species rather than *P. erumei*, to which it was assigned in 1973, particularly as the otoliths are different from the latter species.

**DISTRIBUTION:** *P. belcheri* occurs on west African coast from Guinea (c. 10°N) to Angola (c. 17°S). Attains 60 cm (Nielsen 1981).

**MATERIAL:** 1/1 (16.38 mm OD, 540 mm TL), PEM 0273; Southern African west coast; Id. GJBR.

**Otolith shape:** Elongate ovate. **Thickness:** Moderately thick. **Form:** - Mesial approximately flat, - Lateral approximately flat. **Dorsal margin:** Slightly rounded; **sculpture**, notched and serrate. **Ventral margin:** Approximately flat and irregular. **Posterior margin:** Narrow, pointed and digitate. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior colliculum indented and triangular, posterior indistinct. **Pseudocolliculum:** Absent. **Ostium:** Flares dorsally, triangular and indented. **Cauda:** Gently flexed, tip ends close to posterior margin. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1.3. **Collum:** Absent, slight step up to cauda. **Crista superior:** Well developed along entire sulcus. **Crista inferior:** Well developed to ridge-like along the entire sulcus. **Dorsal depression:** Elongate and moderately deep, area reduced and narrow. **Ventral depression:** Ventral area angled and depressed to margin. **Rostrum:** Large, broad, sharply rounded. **Antirostrum:** Minute and rounded. **Excisura:** Wide, notch very shallow, angle wide.

### CITHARIDAE Nelson No. 433

**Family characteristics:** One species described. Otoliths oval up to c. 7.5 mm OD. Heterosulcoid, opening ostial, ostium tilted and elongate. Cauda deep and slightly sinuate, poorly defined at tip. Heteromorph, colliculi low, posterior very indistinct. Left and right otoliths similar, left side with slightly smoother margins.

#### *Citharoides macrolepis*, SSF No. 258.1 PLATE 139

**DISTRIBUTION:** Known only from Natal to Kenya. Attains 25 cm.

**MATERIAL:** 6/15 (5.0-7.4 mm OD, 154-230 mm TL), PEM 12913 (RUSI 28479), 12967, 12966, 12834 (RUSI 34159), 12980, 12999; Mozambique; Id. MJS, PCH.

**Otolith shape:** Oval. **Thickness:** Moderately thick. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Lateral surface:** Dimple-like depression in centre. **Dorsal margin:** Slightly rounded; **sculpture**, lobed and irregular. **Ventral margin:** Rounded, slightly crenate or irregular. **Posterior margin:** Rounded, crenate or irregular. **Sulcus acusticus:** Ostial, may appear ostio-pseudocaudal if not coated, heterosulcoid. **Colliculum:** Heteromorph, very low anterior colliculum, posterior extremely indistinct. **Pseudocolliculum:** Absent. **Ostium:** Elongate and narrow, antero-dorsally angled. **Cauda:** Narrow, sinuate and deep, poorly defined at tip. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** (Left) 1:0.8, 1:0.8, 1:0.9, 1:0.9, 1:0.8, 1:0.8. **Ostium/cauda:** (Right) 1:1, 1:0.9, 1:0.9, 1:0.9, 1:1, 1:0.9. **Collum:** Absent. **Crista superior:** Narrow ridge along length of sulcus, absent at tip. **Crista inferior:** Poorly developed under ostium, ridge below cauda narrows posteriorly. **Dorsal depression:** Oval and deep. **Ventral depression:** Moderately deep, especially right otoliths. **Rostrum:** Small and sharply



rounded. **Antirostrum:** Absent or minute and rounded. **Excisura:** Narrow, notch very shallow, angle wide.

**BOTHIDAE Nelson No. 434**

**Family characteristics:** Otoliths of five species described; in addition, two putative species are described on the basis of otolith morphology which differs between individuals originally identified as *Chascanopsetta*. Otoliths oblong, oval or discoid up to c. 5.6 mm OD. Either hetero- or homosulcoid. Left and right otoliths may vary considerably in details but usually equal-sized. Ostial (usually left) or mesial openings (usually right otoliths) with the ostium generally longer than the cauda. Colliculi usually depressed or low and either hetero- or homomorph. Dorsal and ventral depressions often joined in a horse-shoe shape.

**Key**

- 1a. Otolith oblong; margins of otolith very irregular; otolith broad and elongate; sulcus not pit-like or slit-like; cauda short and narrow . . . *Pseudorhombus arsius* 259.17
- 1b. Otolith rectangular-oval or discoid; margins of otolith slightly irregular, lobed or entire; sulcus elongate and deep or slit-like and pit-like . . . . . 2
- 2a. Otolith (at least left side) approximately rectangularly oval; crista superior well developed; dorsal depression absent; ventral depression slit-like; sulcus slit-like; ostium bulbous . . . . . *Bothus mancus* 259.3
- 2b. Otolith oval or discoid; crista superior well developed or absent; dorsal and ventral depressions present, joined to form crescentic or horse-shoe shape . . . . . 3
- 3a. Ostium elongate; cauda shorter than ostium; crista superior and inferior ridge-like, broad and rugose . . . 4
- 3b. Ostium oval or slit-like; cauda and ostium similar sized; crista superior and inferior narrow and ridge-like but not rugose . . . . . 5
- 4a. Ostium and cauda not deeply depressed; cristae slightly rugose; otolith oval to elongate; dorsal and ventral depressions moderately shallow . . . . . *Arnoglossus capensis* 259.1
- 4b. Ostium and cauda deep, slit or pit-like; cristae very rugose; dorsal and ventral depressions deep . . . . . *Laeops pectoralis* 259.13
- 5. Three apparently different species of *Chascanopsetta* which exhibit features which differ considerably, but grouped here pending further taxonomic investigation.

***Arnoglossus capensis*, SSF No. 259.1 PLATE 139**

**DISTRIBUTION:** Natal to Angola, St Helena and Ascension Is. Attains 18 cm.

**MATERIAL:** 7/45 (1.9-2.9 mm OD, 84-172 mm TL), PEM 14396, 11495, 14388, 14383, 11623 (RUSI 28487), 15036, 11661 (RUSI 28487), [11605 (RUSI 34067), 12543 (RUSI 34068), 12544 (RUSI 28517), 12669 (RUSI 28515), 14377 (RUSI 28518)]; Cape south coast; Id. MJS, PCH.

**Otolith shape:** Oval. Note left and right otoliths are similar but not mirror images. Intra-specific variation considerable. **Thickness:** Moderately thick. **Form:** - Mesial convex, - Lateral approximately flat. **Dorsal margin:** Slightly rounded; **sculpture**, slightly lobed or entire. **Ventral margin:** Rounded or angular, wider posteriorly, slightly lobed or entire. **Posterior margin:** Rounded or sharply rounded and lobed or entire. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, colliculi depressed. **Pseudocolliculum:** Absent. **Ostium:** Left and right otoliths vary inconsistently, narrow and triangular or oval. **Cauda:** Slit-like or oval, deeper than ostium. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted on internal walls of cristae. **Ostium/cauda:** (Left) 1:0.9, 1:0.7, 1:0.6, 1:0.7, 1:0.6, 1:0.9, 1:0.5.

**Ostium/cauda:** (Right) 1:0.9, 1:0.7, 1:0.9, 1:1.1, 1:0.9, 1:0.9, 1:0.7. **Collum:** Present or may have a slit passing through. **Crista superior:** Well developed over anterior ostium, broad, rough ridge along rest of sulcus, tip well developed or ridge-like. **Crista inferior:** Well developed under anterior ostium, broad, flat ridge elsewhere. **Dorsal depression and ventral depression:** may be joined forming horseshoe, or both crescentic. **Rostrum:** Short and broad or minute and sharply rounded. **Antirostrum:** Absent or minute and rounded. **Excisura:** Narrow, notch extremely shallow, angle wide.

***Bothus mancus*, SSF No. 259.3 PLATE 139**

**DISTRIBUTION:** Widely distributed from Durban to Hawaii and Easter Is. Also reported from Mexico. Attains 42 cm.

**MATERIAL:** 2/2 (2.35, 2.6 mm OD, 339, 400 mm TL), PEM 15641, 14539; Comoro Ids, Mauritius; Id. PCH, MJS.

**Otolith shape:** Rectangular-oval. **Thickness:** Moderately thick. **Form:** - Mesial slightly convex, - Lateral flat. **Dorsal margin:** Slightly rounded; **sculpture**, slightly irregular. **Ventral margin:** Approximately flat and slightly irregular. **Posterior margin:** Rounded and crenate or irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, colliculi indistinct. **Pseudocolliculum:** Absent. **Ostium:** Bulbous ventrally, moderately deep. **Cauda:** Slightly ventrally flexed and deep. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** (Left) 1:1.1, 1:1.3. **Collum:** Absent. **Crista superior:** Well developed along entire sulcus. **Crista inferior:** Poorly developed under ostium, with rough ridge under cauda, may extend forward to ostium. **Dorsal depression:** Absent. **Ventral depression:** Groove-like under ridge. **Rostrum:** Short, broad and rounded. **Antirostrum:** Short, broad and rounded. **Excisura:** Narrow, notch very shallow, angle wide.

***Chascanopsetta* sp. Kenya form, SSF No. 259.-**

**PLATE 140**

**DISTRIBUTION:** *Chascanopsetta lugubris* has been recorded from Natal to Delagoa Bay; Indo-Pacific and Atlantic oceans in 120-977m. Examination of the otoliths have revealed three apparently different forms or species which are treated separately here. They await further investigation.

**MATERIAL:** 3/3 (3.0-3.85 mm OD, 276-303 mm TL), PEM 5038, 5036, 5037 (part of series RUSI 13780, 13743); Kenya; Id. PCH.

**Otolith shape:** Approximately oval. **Thickness:** Thick. **Form:** - Mesial flat, - Lateral flat. **Dorsal margin:** Slightly rounded; **sculpture**, slightly irregular. **Ventral margin:** Slightly rounded and entire. **Posterior margin:** (L) rounded; (R) sharply rounded and entire. **Sulcus acusticus:** (L) ostial and heterosulcoid; (R) usually mesial, appears homosulcoid. **Colliculum:** Colliculi depressed. **Pseudocolliculum:** Absent. **Ostium:** (L) slit-like and slightly flared; (R) pit-like. **Cauda:** (L) oval and deep, may angle postero-ventrally; (R) pit-like. **Ostio-caudal differentiation:** Dorso-ventrally constricted on internal margin of cristae. **Ostium/cauda:** (L) 1:0.7, 1:0.9, 1:0.6. **Ostium/cauda:** (R) 1:0.5, 1:1, 1:0.5. **Collum:** (R) present; (L) may be absent. **Crista superior:** Ridge-like along entire sulcus, joining crista inferior, poorly developed at anterior ostium tip in right otoliths. **Crista inferior:** Ridge-like along entire sulcus, but absent at anterior tip of right otoliths. **Dorsal depression and ventral depression:** joined in horseshoe shape, (L) depression shallower than (R). **Rostrum:** (L) short, broad and rounded; (R) absent. **Antirostrum:** (L) short and broad and sharply rounded; (R) absent. **Excisura:** (L) narrow, notch very shallow, angle wide; (R) excisura absent.

***Chascanopsetta* sp. Natal and Mozambique form,**

**SSF No. 259.- PLATE 140**

**DISTRIBUTION:** See previous description.



**MATERIAL:** 8/8 (1.07-1.81 mm OD, 180-260 mm TL), PEM 0413, 13037, 12852, 13033 (RUSI 34089), 13035, 13034 (RUSI 34084), 13036, 0431; off Durban and Mozambique; Id. GJBR, MJS, PCH.

**Otolith shape:** Square to oval. **Thickness:** Moderately thick. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** (L) slightly rounded or flat; (R) rounded; **sculpture**, approximately entire. **Ventral margin:** (L) slightly rounded or flat; (R) rounded and entire. **Posterior margin:** Sharply rounded or emarginate and entire. **Sulcus acusticus:** (L) ostial, heterosulcoid; (R) mesial, homosulcoid. **Colliculum:** (L) heteromorph with protruding colliculum; (R) homomorph, very low anterior and posterior colliculi. **Pseudocolliculum:** Absent. **Ostium:** (L) elongate, flares slightly with protruding colliculum; (R) oval. **Cauda:** (L) oval and deep; (R) oval and slightly raised. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** (L) 1:0.5, 1:0.7, 1:1, 1:0.9, 1:0.7, 1:0.5, 1:1, 1:0.8 **Ostium/cauda:** (R) 1:0.8, 1:1, 1:0.8, 1:1, 1:0.9, 1:1.6, 1:0.9, 1:1.1. **Collum:** Absent. **Crista superior:** (L) well developed over ostium, ridge-like over cauda; (R) poorly developed or low, narrow ridge from ostium to cauda. **Crista inferior:** (L) well developed under ostium, ridge-like under cauda; (R) poorly developed or low ridge in mid-sulcus. **Dorsal depression and ventral depression:** Joined, forming a horseshoe, (L) shallower; (R) deeper. **Rostrum:** (L) small and rounded; (R) absent. **Antirostrum:** (L) minute and rounded; (R) absent. **Excisura:** (L) narrow, notch very shallow, angle wide; (R) excisura absent.

#### *Chascanopsetta* sp. Cape form, SSF No. 259.- PLATE 140

**DISTRIBUTION:** See Kenya form.

**MATERIAL:** 2/14 (1.1, 1.4 mm OD, 157, 160 mm TL), PEM 14424, 14972 (RUSI 35521); Cape south coast; Id. MJS, PCH.

**Otolith shape:** Approximately discoid. **Thickness:** Thick. **Form:** - Mesial flat, - Lateral convex. **Dorsal margin:** Rounded; **sculpture**, slightly irregular. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Slightly rounded or flat and slightly irregular. **Sulcus acusticus:** (L) ostial and heterosulcoid; (R) mesial, homosulcoid. **Colliculum:** (L) heteromorph, colliculi depressed; (R) heteromorph, low anterior and posterior colliculi. **Pseudocolliculum:** Absent. **Ostium:** (L) oval and slightly flared; (R) oval, poorly defined. **Cauda:** (L) oval or circular; (R) oval and poorly defined. **Ostio-caudal differentiation:** Slightly ventrally constricted. **Ostium/cauda:** (L) 1:0.7, 1:0.9; (R) 1:1.4, 1:1.1. **Collum:** (L) May be present and low; (R) absent. **Crista superior:** (L) ridge-like from ostium to cauda; (R) well developed or ridge-like over ostium, very poorly developed or absent over cauda. **Crista inferior:** (L) ridge-like from ostium to cauda; (R) poor to absent under ostium, low ridge under cauda. **Dorsal depression and ventral depression:** Joined as horse-shoe shaped depression. **Rostrum:** (L) short, broad and rounded; (R) absent. **Antirostrum:** (L) short, broad and rounded; (R) absent. **Excisura:** (L) narrow, notch very shallow, angle wide; (R) absent.

#### *Laeops pectoralis*, SSF No. 259.13 PLATE 141

**DISTRIBUTION:** Natal, Delagoa Bay and Mombasa. Attains 19 cm.

**MATERIAL:** 3/13 (2.65-3.3 mm OD, 150-174 mm TL), PEM 12833, 13001 & 13040 (all RUSI 28491); Mozambique; Id. MJS, PCH.

**Otolith shape:** Approximately oval. **Thickness:** Thick. **Form:** - Mesial convex, - Lateral convex. **Dorsal margin:** Slightly rounded to flat; **sculpture**, slightly irregular. **Ventral margin:** Rounded, slightly irregular or entire. **Posterior margin:** Rounded and slightly lobed or slightly irregular. **Sulcus acusticus:** (L) mesial, but may be ostial in large (c. 3 mm OD); (R) mesial, both

heterosulcoid. **Colliculum:** Heteromorph, colliculi depressed. **Pseudocolliculum:** Absent. **Ostium:** Shovel or spear-like and deep. **Cauda:** Smaller, oval and deep. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted on inside margins of cristae. **Ostium/cauda:** (L) 1:0.7, 1:0.6, 1:0.6; (R) 1:0.8, 1:1, 1:0.8. **Collum:** Present, may have narrow slit through it. **Crista superior:** Ridge-like, broad and nodular along entire sulcus joining crista inferior. **Crista inferior:** Ridge-like, broad and slightly nodular. **Dorsal depression:** Oval, elongate, covering most of dorsal area, deeper on left otoliths. **Ventral depression:** Narrow and elongate, deeper on right otoliths. **Rostrum:** (L) if present, small, broad and rounded; (R) absent. **Antirostrum:** Absent. **Excisura:** (L) if present, narrow, notch shallow, angle wide; (R) excisura absent.

#### *Pseudorhombus arsius*, SSF No. 259.17 PLATE 141

**DISTRIBUTION:** Indo-West Pacific, south to Algoa Bay and possibly to Knysna. Attains 36 cm.

**MATERIAL:** 3/3 (3.45-5.58 mm OD, 188-395 mm TL), PEM 0838, 0366, 1009; Swartkops and Durban; Id. GJBR.

**Otolith shape:** Approximately oblong. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded; **sculpture**, very irregular. **Ventral margin:** Slightly rounded, lobed or irregular. **Posterior margin:** Oblique or sharply rounded and very irregular. **Sulcus acusticus:** Usually mesial but may be ostial, heterosulcoid. **Colliculum:** Heteromorph, anterior and posterior colliculi low but distinct. **Pseudocolliculum:** Absent. **Ostium:** Approximately oval and elongate, walls poorly defined. **Ostium** of left otoliths narrow anteriorly. Opens to margin in large otoliths (c. 5.5 mm OD). **Cauda:** Short, approximately straight, narrows posteriorly. **Ostio-caudal differentiation:** Slight ventral constriction. **Ostium/cauda:** (L) 1:0.7, 1:0.7, 1:0.5; (R) 1:0.8, 1:0.6, 1:0.6. **Collum:** Absent. **Crista superior:** Poorly developed above ostium, well developed over cauda. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Shallow and elongate, may be absent in large otoliths (c. 5.5 mm OD). **Ventral depression:** Absent or groove-like from caudal tip to neck. **Rostrum:** If present, small, broad and rounded. **Antirostrum:** If present, very small and rounded. **Excisura:** If present, very narrow, notch very shallow and angle wide.

#### PLEURONECTIDAE Nelson No. 435

**Family characteristics:** Three species described. Otoliths in this family are extremely varied, possibly suggesting different lineages. Otoliths oval, rounded-pentagonal or oval-ovate but small, up to c. 3.5 mm OD. Heterosulcoid, and ostial, mesial or parastial. Colliculi are either heteromorph or may not be visible. Cristae ridge-like or well developed, depressions deep forming horseshoe shape, joining behind cauda, or very shallow.

##### Key

- 1a. Otolith oval ovate; rostrum tapered and pointed; excisural notch distinct; antirostrum and broad . . . . . *Samariscus triocellatus* 260.5
- 1b. Otolith oblong to oval or pentagonal; rostrum small and short; excisural notch indistinct; antirostrum small or absent . . . . . 2
- 2a. Otolith oblong to oval; crista superior and inferior well developed or a low ridge; dorsal and ventral depressions very shallow and small . . . . . *Paralichthodes algoensis* 260.2
- 2b. Otolith pentagonal; crista superior and inferior ridge-like and joined; dorsal and ventral depressions deep and crescentic or joined and horseshoe shaped . . . . . *Poecilopsetta natalensis* 260.3



*Paralichthodes algoensis*, SSF No. 260.2 PLATE 141

**DISTRIBUTION:** Known only from Mossel Bay to Delagoa Bay in 1-100m. Attains 50 cm.

**MATERIAL:** 1/1 (2.15 mm OD, 140 mm TL), PEM 0365; Durban; Id. GJBR.

**Otolith shape:** Approximately oblong to oval. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Dorsal margin:** Slightly rounded; **sculpture,** irregular. **Ventral margin:** Slightly rounded and irregular. **Posterior margin:** Rounded or flat and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Approximately oval. **Cauda:** Straight, flares posteriorly with rounded, poorly defined, deep tip. **Ostio-caudal differentiation:** Ventrally constricted. **Ostium/cauda:** (L) 1:1; (R) 1:1.2. **Collum:** Absent. **Crista superior:** Well developed from ostium to cauda, low ridge may be present close to caudal tip. **Crista inferior:** Very poorly developed under ostium and at caudal tip, well developed or low ridge under cauda. **Dorsal depression:** Very shallow, area may be pitted. **Ventral depression:** Shallow depression near tip and mid-cauda. **Rostrum:** Short, broad and rounded. **Antirostrum:** Small and rounded. **Excisura:** Narrow, notch very shallow, angle wide.

*Poecilopsetta natalensis*, SSF No. 260.3 PLATE 142

**DISTRIBUTION:** Natal to Kenya; also reported from Taiwan. Attains 15 cm.

**MATERIAL:** 2/2 (3.0, 3.5 mm OD, 153, 165 mm TL), PEM 13002 (RUSI 28478), 12984 (RUSI 28478); Mozambique; Id. PCH.

**Otolith shape:** Rounded to pentagonal. **Thickness:** Thick posteriorly, narrowing anteriorly. **Form:** - Mesial approximately flat, - Lateral convex and bulbous. **Dorsal margin:** Slightly rounded or angular; **sculpture,** irregular. **Ventral margin:** Rounded or angular and irregular. **Posterior margin:** Flat or slightly rounded and irregular. **Sulcus acusticus:** Mesial or para-ostial, heterosulcoid. **Colliculum:** Heteromorph, colliculi depressed. **Pseudocolliculum:** Absent. **Ostium:** Elongate, depressed in centre with anterior rim which may have narrow canal opening to margin. **Cauda:** (L) large, broad and deep; (R) short, narrow and deep. **Ostio-caudal differentiation:** Dorso-ventrally constricted on inner margins of cristae. **Ostium/cauda:** (L) 1:0.7, 1:0.5; (R) 1:0.4, 1:0.4. **Collum:** Absent, neck constricted. **Crista superior:** Ridge-like along entire sulcus, joining crista inferior. **Crista inferior:** Ridge-like and broad, joining crista superior and may close ostium. **Dorsal depression:** (L) crescentic; (R) horseshoe shaped, continuous with ventral depression. **Ventral depression:** (L) crescentic, separated from dorsal depression; (R) horseshoe shaped. **Rostrum:** If present, large, broad and rounded. **Antirostrum:** If present, minute and sharply rounded. **Excisura:** If present, very narrow, notch very shallow, angle wide.

*Samariscus triocellatus*, SSF No. 260.5 PLATE 142

**DISTRIBUTION:** Sodwana Bay; western Pacific and Hawaii. Attains 7 cm.

**MATERIAL:** 1/1 (1.0 mm OD, 62 mm TL), 0767H; Sodwana; Id. JER.

**Otolith shape:** Oval-ovate. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral slightly convex. **Dorsal margin:** Slightly rounded; **sculpture,** approximately entire. **Ventral margin:** Rounded and entire. **Posterior margin:** Rounded and entire. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Colliculi not visible. **Pseudocolliculum:** Absent. **Ostium:** Flares and opens widely. **Cauda:** Straight, very slightly flared and poorly defined tip. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted on internal margins of cristae. **Ostium/cauda:**

1:0.9. **Collum:** Absent. **Crista superior:** Poorly developed over ostium, low ridge above cauda, absent at tip. **Crista inferior:** Low ridge along entire sulcus. **Dorsal depression:** Shallow horse-shoe shaped. **Ventral depression:** Shallow and horse-shoe shaped, continuous with dorsal depression. **Rostrum:** Large, tapered and pointed. **Antirostrum:** Short, broad and rounded. **Excisura:** Moderately wide, notch moderate, angle wide.

CYNOGLOSSIDAE Nelson No. 436

**Family characteristics:** Four species described and an additional putative species or different form of *Cynoglossus* is also described. Otoliths rounded-triangular or oval to rounded-rectangular, up to at least 5.6 mm OD. Heterosulcoid or archaesulcoid with mesial or narrow ostial opening. Homomorph, single, fused colliculum which is often funnel shaped, usually slightly raised but may be depressed. Cristae usually very poorly developed, dorsal, ventral and posterior areas often raised with grooves around them.

**Key**

- 1a. Otolith oval to rounded-rectangular; sulcus archaesulcoid; colliculum approximately oval and depressed . . . . . *Cynoglossus marleyi* 261.8
- 1b. Otolith rounded-triangular; sulcus heterosulcoid; single fused, raised colliculum, not oval in shape . . . . . 2
- 2a. Posterior part of colliculum forms rounded-triangular shape with rounded posterior wall; colliculum rounded funnel shape; dorsal, ventral and posterior areas not distinctly raised . . . . . *Cynoglossus attenuatus* 261.2
- 2b. Posterior part of colliculum triangular with flat or straight posterior wall; colliculum angular funnel shaped; dorsal, ventral and posterior areas raised or slightly raised . . . . . 3
- 3a. Anterior part of colliculum relatively short and broad; posterior part of colliculum relatively large. . . . . *Cynoglossus capensis* 261.3
- 3b. Anterior part of colliculum narrow and elongate; posterior part of colliculum reduced and angular . . . . . 4
- 4a. Postero-dorsal corner of otolith angular to right-angled; otolith margin slightly irregular; dorsal, ventral and posterior areas slightly raised; colliculum small . . . . . *Cynoglossus cf capensis* Mozambique form 261.-
- 4b. Postero-dorsal corner of otolith rounded or emarginate below and behind corner; margins of otolith generally irregular; dorsal, ventral and posterior areas raised with depressed grooves around them; colliculum slightly larger, becomes depressed in centre with growth . . . . . *Cynoglossus zanzibarensis* 261.9

*Cynoglossus attenuatus*, SSF No. 261.2 PLATE 142

**DISTRIBUTION:** Found only from Durban to Delagoa Bay. Attains 31 cm.

**MATERIAL:** 4/18 (3.45-4.0 mm OD, 215-252 mm TL), PEM 15294 (RUSI 36879), 6676, 6675, 6678 (RUSI 34160), [15295-15299 all (RUSI 36879)]; ORI and off Matikulu River mouth; Id. MJS, PCH.

**Otolith shape:** Approximately rounded-triangular. **Thickness:** Moderately thick. **Form:** - Mesial slightly convex, - Lateral concave or flat. **Dorsal margin:** Approximately flat or slightly rounded; **sculpture,** slightly irregular. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Approximately flat and postero-dorsal corner angled. **Sulcus acusticus:** Ostial, may be mesial, heterosulcoid. **Colliculum:** Homomorph, single fused and raised colliculum, rounded funnel shaped. **Pseudocolliculum:** Absent. **Ostium:** Narrow, sulcus angled antero-ventrally. **Cauda:** Broad and approximately roundly triangular. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** (L) 1:0.9, 1:0.7, 1:0.9, 1:0.7; (R) 1:1.1, 1:1.7, 1:1.5, 1:0.9. **Collum:**



Absent. **Crista superior:** Absent or poorly developed along entire sulcus, may be a low ridge at caudal tip. **Crista inferior:** Poorly developed or absent along entire sulcus. **Dorsal depression:** Crescentic, shallow around postero-dorsal corner, near margin. **Ventral depression:** Absent, may be groove near margin. **Rostrum:** Absent or minute and sharply rounded. **Antirostrum:** Absent or large and rounded. **Excisura:** Absent or very narrow, notch very shallow, angle acute.

#### *Cynoglossus capensis*, SSF No. 261.3 PLATE 143

**DISTRIBUTION:** Kunene River (Namibia) to Natal. Attains 31 cm. **NOTE:** Because of differences in the otoliths our material has been split into two forms, one collected from the Cape and Natal and one from Mozambique. The validity of this split needs further investigation.

**MATERIAL:** 5/135 (2.1-4.8 mm OD, 72-206 mm TL), PEM 4318, 4552, 2585, 3755, 3352; Cape south coast and Knysna; Id. MJS, PCH.

**Otolith shape:** Rounded-triangular. **Thickness:** Moderate. **Form:** - Mesial slightly convex, - Lateral flat. **Dorsal margin:** Approximately flat; **sculpture,** slightly irregular. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Flat or emarginate and slightly irregular, postero-dorsal corner angular. **Sulcus acusticus:** Ostial or pseudo-ostial, heterosulcoid. **Colliculum:** Homomorph, single raised, fused colliculum, angularly funnel shaped. **Pseudocolliculum:** Absent. **Ostium:** Narrow, flared slightly anteriorly. **Cauda:** Flared, approximately triangular and blunt. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** (L) 1:2, 1:1.3, 1:0.9, 1:0.9, 1:1; (R) 1:1.4, 1:1.7, 1:1.7, 1:1.4, 1:1.4. **Collum:** Absent. **Crista superior:** Poorly developed along entire sulcus. **Crista inferior:** Poorly developed along entire sulcus. **Dorsal depression:** Shallow groove near margin. **Ventral depression:** Shallow groove near margin, posterior groove along posterior margin. **Rostrum:** Absent or minute. **Antirostrum:** Absent or short and broad. **Excisura:** Absent or very narrow, notch very shallow, angle acute.

#### *Cynoglossus cf. capensis* - Mozambique form, SSF No. 261.- PLATE 143

**MATERIAL:** 2/2 (3.0, 4.2 mm OD, 162, 182 mm TL), PEM 13039, 12886; Mozambique; Id. PCH.

**Otolith shape:** Rounded-triangular. **Thickness:** Moderately thick. **Form:** - Mesial slightly convex, - Lateral slightly convex. **Lateral surface:** (R) bulbous; (L) indented in centre. **Dorsal margin:** Flat; **sculpture,** slightly irregular. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Approximately flat and slightly irregular, postero-dorsal corner angled. **Sulcus acusticus:** Ostial or pseudo-ostial, heterosulcoid. **Colliculum:** Homomorph, single, raised and fused colliculum, tapered funnel shaped. **Pseudocolliculum:** Absent. **Ostium:** Very narrow, does not flare anteriorly. **Cauda:** Triangular and blunt. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** (L) 1:1.1, 1:0.9; (R) 1:1, 1:1.4. **Collum:** Absent. **Crista superior:** Poorly developed along entire sulcus. **Crista inferior:** Poorly developed along entire sulcus. **Dorsal depression:** Dorsal area raised with groove-like depressions around it. **Ventral depression:** Ventral and posterior areas raised with groove-like depressions around them. **Rostrum:** Absent. **Antirostrum:** Absent or short, broad and rounded. **Excisura:** Absent or very narrow, notch absent.

#### *Cynoglossus marleyi*, SSF No. 261.8 PLATE 143 & 144

**DISTRIBUTION:** Durban to Delagoa Bay. Attains 35 cm.

**MATERIAL:** 3/7 (2.7-3.1 mm OD, 198-282 mm TL), PEM 12835 (RUSI 34159), 12987, 12934; Mozambique; Id. MJS, PCH.

**Otolith shape:** Oval to roundly rectangular. **Thickness:** Thick. **Form:** - Mesial slightly convex, - Lateral convex. **Dorsal margin:** Slightly rounded or flat; **sculpture,** slightly irregular. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Slightly rounded and slightly irregular. **Sulcus acusticus:** Mesial, archaesusulcoid. **Colliculum:** Homomorph, single colliculum depressed and approximately oval. **Pseudocolliculum:** Absent. **Ostium and cauda:** Undifferentiated, sulcus an oval cleft. **Ostio-caudal differentiation:** Absent. **Collum:** Absent. **Crista superior:** Well developed or a low ridge along entire sulcus, poorly developed anteriorly. **Crista inferior:** Poorly developed or a low ridge along sulcus. **Dorsal depression:** Continuous with ventral depression, forming a horse-shoe. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

#### *Cynoglossus zanzibarensis*, SSF No. 261.9 PLATE 144

**DISTRIBUTION:** Western Cape province to Kenya; common off the Cape south coast. Occurs in deeper water than *C. capensis* in the Cape (MJS). Attains 32 cm.

**MATERIAL:** 7/127 (3.7-6.6 mm OD, 167-375 mm TL), PEM 14431 (RUSI 34095), 15062, 12684, 3017, 3766, 14162 (RUSI 34095), 15035, [14161 (RUSI 34095), 9298 (RUSI 37475)]; Cape south and west coasts; Id. MJS, PCH.

**Otolith shape:** Rounded-triangular. **Thickness:** Moderately thick. **Form:** - Mesial slightly convex, - Lateral convex. **Lateral surface:** (R) bulbous; (L) indented in centre. **Dorsal margin:** Flat or slightly rounded; **sculpture,** slightly irregular. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Flat or slightly rounded, may be emarginate and slightly irregular. **Sulcus acusticus:** Pseudo-ostial or ostial, heterosulcoid. **Colliculum:** Homomorph, single raised, fused colliculum, may be depressed in centre in large otoliths (c. 6.6 mm OD), angularly funnel shaped. **Pseudocolliculum:** Absent. **Ostium:** Straight and narrow, poorly defined at tip and may penetrate anterior wall. **Cauda:** Triangular and blunt. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** (L) 1:1, 1:1.1, 1:1, 1:1, 1:1, 1:1.5, 1:1.3; (R) 1:1.2, 1:1, 1:1.3, 1:1, 1:1, 1:1, 1:1.6. **Collum:** Absent. **Crista superior:** Poorly developed along entire sulcus. **Crista inferior:** Poorly developed along entire sulcus. **Dorsal depression:** Dorsal area raised with groove-like depression around it. **Ventral depression:** Ventral area and posterior area raised with grooves around them. **Rostrum:** Absent or minute and rounded. **Antirostrum:** Absent or broad and rounded. **Excisura:** Absent or minute, notch very shallow, angle wide.

#### SOLEIDAE Nelson No. 437

**Family characteristics:** Eight species described. Otoliths oval or oblong, up to at least 6.1 mm OD. Archaesusulcoid, pseudo-archaesusulcoid or heterosulcoid. Usually with mesial or pseudo-ostial openings, may be ostial. Homomorph with similar or fused colliculi, rarely heteromorph. Sulcus poorly defined, dorsal and ventral depressions often horseshoe shaped around sulcus and joined posteriorly.

##### Key

- 1a. Otolith twisted along its length; otolith shape rounded-rectangular . . . . . 2
- 1b. Otolith flat, not twisted; otolith shape oval to oblong, may be notched . . . . . 3
- 2a. Otolith elongate; postero-dorsal corner of otolith protrudes, may be angular; posterior margin of otolith emarginate or flat; dorsal and ventral areas rugose . . . . . *Austroglossus pectoralis* 262.3
- 2b. Otolith more rounded than previous sp.; postero-dorsal corner of otolith rounded or slightly protruding; dorsal and ventral areas not rugose . . . . . *Austroglossus microlepis* 262.2



- 3a. Sulcus heterosulcoid; sulcus opening ostial; colliculi heteromorph . . . . . 4
- 3b. Sulcus archaesulcoid or pseudo-archaesulcoid; sulcus opening mesial or pseudo-ostial; colliculi homomorph or heteromorph . . . . . 5
- 4a. Sulcus slit-like; postero-dorsal corner of otolith produced; ostium narrow but relatively deep; cauda slit-like; otolith shape approximately oval; dorsal and ventral grooves near margin absent . . . . . *Synaptura marginata* 262.14
- 4b. Sulcus elongate and shallow; postero-dorsal corner of otolith not produced; ostium relatively shallow; caudal tip rounded and relatively wide; otolith approximately oblong, tapered anteriorly; dorsal and ventral grooves near margins . . . . . *Synapturichthys kleini* 262.15
- 5a. Postero-dorsal corner of otolith distinctly produced and rounded; posterior margin of otolith very emarginate; ventral corner of otolith produced and rounded; dorsal depression absent . . . . . *Solea fulvomarginata* 262.13
- 5b. Postero-dorsal corner of otolith not produced; posterior margin of otolith not distinctly emarginate; postero-ventral corner of otolith not produced . . . . . 6
- 6a. Crista superior and crista inferior well developed or raised as very low, narrow ridges; dorsal and ventral depressions elongate and shallow, not joined as a horseshoe shape . . . . . *Aesopia cornuta* 262.1
- 6b. Crista superior and crista inferior broad and distinctly ridge-like; dorsal and ventral depressions joined as a horseshoe shape . . . . . 7
- 7a. Otolith shape oval to oblong; posterior margin of otolith slightly rounded; ventral margin rounded; sulcus oval; cristae rounded posteriorly at caudal tip . . . . . *Solea bleekeri* 262.12
- 7b. Otolith shape approximately oval; posterior margin of otolith flat or emarginate; ventral margin of otolith rounded posteriorly, tapered anteriorly; sulcus may be narrow anteriorly; cristae blunt and square posteriorly . . . . . *Heteromycteris capensis* 262.5

***Aesopia cornuta*, SSF No. 262.1 PLATE 144**

**DISTRIBUTION:** Natal to Mozambique; Red Sea, India, Japan. Attains 22 cm.

**MATERIAL:** 1/1 (2.4 mm OD, 135 mm TL), PEM 0453; Durban; Id. GJBR.

**Otolith shape:** Oval. **Thickness:** Moderately thick. **Form:** - Mesial slightly convex to flat, - Lateral flat. **Dorsal margin:** Slightly rounded; **sculpture,** slightly irregular. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Slightly rounded or flat and slightly irregular. **Sulcus acusticus:** Pseudo-ostial, archaesulcoid. **Colliculum:** Homomorph, very low fused colliculum. **Pseudocolliculum:** Absent. **Ostium** and **cauda:** Undifferentiated, sulcus oval and elongate, poorly defined anteriorly. **Ostio-caudal differentiation:** Absent. **Collum:** Absent. **Crista superior:** Well developed to low rounded ridge along entire sulcus, more raised in right otolith. **Crista inferior:** Well developed to low ridge along sulcus, more developed in right otolith. **Dorsal depression:** Elongate and shallow. **Ventral depression:** Elongate and shallow. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

***Austroglossus microlepis*, SSF No. 262.2  
PLATE 144 & 145**

**DISTRIBUTION:** From northern Namibia to False Bay. Attains 75 cm.

**MATERIAL:** 6/40 (2.15-4.8 mm OD, 145-365 mm TL), PEM 12177, 12174, 3867 (RUSI 12029), 12087, 12085, 12088; Cape west coast; Id. GJBR, MJS, PCH.

**Otolith shape:** Approximately oval. **Thickness:** Moderately thin. **Form:** - Mesial slightly convex, - Lateral slightly concave. **Lateral surface:** Otolith slightly twisted longitudinally. **Dorsal margin:** Slightly rounded, flat or emarginate; **sculpture,** irregular. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Slightly rounded or oblique and slightly irregular. **Sulcus acusticus:** Mesial or pseudo-ostial, may appear ostial if uncoated, archaesulcoid. **Colliculum:** Homomorph, a single variable, indented colliculum. **Pseudocolliculum:** Absent. **Ostium** and **cauda:** Undifferentiated, sulcus elongate, irregular waisting, poorly defined. **Ostio-caudal differentiation:** Absent. **Collum:** Absent. **Crista superior:** Poorly or well developed along sulcus length. **Crista inferior:** Poorly developed along length of sulcus. **Dorsal depression:** Elongate, horseshoe shaped (deeper in left otoliths) joining **ventral depression.** **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

***Austroglossus pectoralis*, SSF No. 262.3 PLATE 145**

**DISTRIBUTION:** Known only from the Cape to Natal. Attains 58 cm.

**MATERIAL:** 6/55 (2.2-6.1 mm OD, 130-412 mm TL), PEM 4574 (RUSI 13264), 12506, 12509 (RUSI 28519), 3315, 15037, 2985; Cape south coast; Id. MJS, PCH.

**Otolith shape:** Oval becoming oblong. **Thickness:** Moderately thin. **Form:** - Mesial flat, - Lateral flat. **Lateral surface:** Slightly twisted longitudinally. **Dorsal margin:** Flat; **sculpture,** slightly irregular. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Flat or emarginate and slightly irregular. **Sulcus acusticus:** Mesial or pseudo-ostial, archaesulcoid. **Colliculum:** Heteromorph, irregular low colliculi, may have posterior pit and may be joined. **Pseudocolliculum:** Absent. **Ostium** and **cauda:** Undifferentiated, sulcus oval and depressed with irregular surface. **Ostio-caudal differentiation:** Absent but irregular waisting. **Collum:** Absent. **Crista superior:** Poorly developed or a very low ridge along entire sulcus, absent anteriorly. **Crista inferior:** Poorly developed or low ridge along entire sulcus. **Dorsal depression:** Horseshoe shaped (deeper in left otoliths), joining **ventral depression.** Dorsal area has ridge, dorsal and ventral areas may be rugose. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

***Heteromycteris capensis*, SSF No. 262.5 PLATE 145**

**DISTRIBUTION:** Known only from Walvis Bay to Maputo. Attains 15 cm.

**MATERIAL:** 5/9 (0.9-2.05 mm OD, 43-106 mm TL), PEM 2160, 6057, 4575 (RUSI 13272), 4585, 4019; Cape south coast; Id. MJS, PCH.

**Otolith shape:** Approximately oval. **Thickness:** Moderately thick. **Form:** - Mesial slightly convex, - Lateral slightly concave or flat. **Dorsal margin:** Slightly rounded, flat or emarginate; **sculpture,** slightly irregular. **Ventral margin:** Rounded, tapering anteriorly and slightly irregular. **Posterior margin:** Flat or emarginate and slightly irregular. **Sulcus acusticus:** Mesial, pseudo-ostial or ostial, pseudo-archaesulcoid. **Colliculum:** Heteromorph, low colliculi with pit, may be fused. **Pseudocolliculum:** Absent. **Ostium:** Elongate and poorly defined, may be indistinguishable from cauda. **Cauda:** Short with rounded tip and pit. **Ostio-caudal differentiation:** Absent or with slight constriction on inner cristae. **Collum:** Absent. **Crista superior:** Well developed or very low ridge along entire sulcus, absent at anterior tip. **Crista inferior:** Well developed or low ridge along entire sulcus. **Dorsal depression:** Horseshoe shaped, joins **ventral depression.** **Rostrum:** If present, small and rounded. **Antirostrum:** If present, small and



rounded. **Excisura:** Absent or if present, narrow, notch very shallow, angle acute.

***Solea bleekeri*, SSF No. 262.12 PLATE 146**

**DISTRIBUTION:** False Bay to Maputo. Attains 17 cm.

**MATERIAL:** 6/21 (1.6-2.8 mm OD, 78-128 mm TL), PEM 3740, 15055 & 15054 (both RUSI 35564), 15290 (RUSI 36873), 12512, 12513, [4553 (RUSI 17032), 12511 (RUSI 28481), 15289 & 15291 (both RUSI 36873)]; Cape south coast and off Matikulu R.; Id. MJS, PCH, MEA.

**Otolith shape:** Oval to oblong. **Thickness:** Moderate. **Form:** - **Mesial** slightly convex, - **Lateral** flat or slightly convex. **Dorsal margin:** Slightly rounded; **sculpture**, slightly irregular. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Slightly rounded and slightly irregular. **Sulcus acusticus:** Usually mesial or pseudo-ostial, archaesusloid. **Colliculum:** Homomorph, indistinct, may be fused or separate low colliculi. **Pseudocolliculum:** Absent. **Ostium** and **Cauda:** Undifferentiated, sulcus is elongate with one or two depressions. **Ostio-caudal differentiation:** Not constricted. **Collum:** Absent. **Crista superior:** Low ridge, poorly developed or absent at anterior. **Crista inferior:** Low ridge along entire sulcus, joins crista superior posteriorly. **Dorsal depression:** Horseshoe shaped, joining ventral depression. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

***Solea fulvomarginata*, SSF No. 262.13 PLATE 146**

**DISTRIBUTION:** False Bay to Transkei. Attains 26 cm.

**MATERIAL:** 1/1 (4.35 mm OD, 265 mm TL), PEM 6183; Algoa Bay; Id. MJS.

**Otolith shape:** Approximately oval, emarginate posteriorly. **Thickness:** Moderately thick. **Form:** - **Mesial** convex, - **Lateral** concave. **Dorsal margin:** Slightly rounded; **sculpture**, slightly irregular. **Ventral margin:** Slightly rounded or flat and irregular. **Posterior margin:** Emarginate, crenate and irregular, postero-dorsal corner extended. **Sulcus acusticus:** Mesial, archaesusloid. **Colliculum:** Homomorph with two colliculi depressed in centre. **Pseudocolliculum:** Absent. **Ostium** and **cauda:** Undifferentiated, sulcus narrow and oval with two pits. **Ostio-caudal differentiation:** Not constricted. **Collum:** Low, between the depressions. **Crista superior:** Poorly developed along entire sulcus. **Crista inferior:** Poorly developed along entire sulcus. **Dorsal depression:** Absent, two grooves, one in mid area, one at margin. **Ventral depression:** Shallow depression in mid-area. **Rostrum:** Absent. **Antirostrum:** Absent. **Excisura:** Absent.

***Synaptura marginata*, SSF No. 262.14 PLATE 146**

**DISTRIBUTION:** Knysna to Delagoa Bay; Japan. Attains 50 cm.

**MATERIAL:** 1/1 (3.4 mm OD, 290 mm TL), PEM 0285; Algoa Bay; Id. GJBR.

**Otolith shape:** Approximately oval, postero-dorsal corner extended. **Thickness:** Moderately thin. **Form:** - **Mesial** convex, - **Lateral** concave. **Dorsal margin:** Flat; **sculpture**, slightly irregular. **Ventral margin:** Slightly rounded and slightly irregular. **Posterior margin:** Oblique and emarginate, slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, both colliculi low. **Pseudocolliculum:** Absent. **Ostium:** Long, narrow and moderately deep. **Cauda:** Shallower, short and oval. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:0.3. **Collum:** Absent, step up to cauda. **Crista superior:** Well developed along entire sulcus. **Crista inferior:** Well developed along entire sulcus. **Dorsal depression:** Absent. **Ventral depression:** Absent. **Rostrum:** Short, broad and sharply rounded. **Antirostrum:** Small and sharply rounded. **Excisura:** Narrow, notch very shallow, angle acute.

***Synapturichthys kleini*, SSF No. 262.15 PLATE 146**

**DISTRIBUTION:** Eastern Atlantic and Mediterranean to South Africa and round the south coast to Durban. Attains 40 cm.

**MATERIAL:** 1/1 (7.6 mm OD, 310 mm TL), PEM 2170; Eastern Cape; Id. PCH.

**Otolith shape:** Oblong. **Thickness:** Moderate. **Form:** - **Mesial** slightly convex, - **Lateral** flat. **Dorsal margin:** Rounded; **sculpture**, crenate or slightly irregular. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Flat or slightly emarginate and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Heteromorph, both colliculi very low. **Pseudocolliculum:** Absent. **Ostium:** Elongate, irregular margin, colliculum depressed in centre. **Cauda:** Rounded, oval and deep in centre. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** (L) 1:0.6; (R) 1:0.4. **Collum:** Very low. **Crista superior:** Well developed along entire sulcus. **Crista inferior:** Moderately well developed below ostium, low ridge under cauda. **Dorsal depression:** Horseshoe shaped joining ventral depression, shallow posteriorly. Groove around dorsal and ventral margins. **Rostrum:** Short and sharply rounded. **Antirostrum:** Short and sharply rounded. **Excisura:** Narrow, notch very shallow, angle wide.

**ORDER TETRAODONTIFORMES**

**TRIACANTHODIDAE Nelson No. 438**

**Family characteristics:** Based on the single species available, otoliths hour-glass shaped and small, up to c. 1.6 mm OD. Heterosulcoid with ostio-caudal openings. Ostium small, indented, caudal straight and poorly defined. Heteromorph, posterior colliculum indistinct, anterior depressed. Crista inferior under neck knob-like, area near margin depressed and flat.

***Macrorhamphosodes* sp., SSF No. 265.- PLATE 147**

**DISTRIBUTION:** Two species in this genus known off southern Africa, *M. uradoi* and *M. platycheilus*. (Tyler 1983, pers. comm.).

**MATERIAL:** 1/1 (1.45 mm OD, 107 mm SL), PEM 5059; Kenya; Id. PCH.

**Otolith shape:** Hour-glass. **Thickness:** Moderately thick in centre, margins thin. **Form:** - **Mesial** convex, - **Lateral** approximately flat. **Dorsal margin:** Slightly rounded; **sculpture**, slightly irregular. **Ventral margin:** Well rounded, slightly irregular. **Posterior margin:** Notched and slightly irregular. **Sulcus acusticus:** Ostio-caudal, heterosulcoid. **Colliculum:** Heteromorph, anterior small and depressed, posterior elongate and indistinct. **Pseudocolliculum:** Absent. **Ostium:** Oval, reduced, narrow and depressed. **Cauda:** Elongate and straight, poorly defined. **Ostio-caudal differentiation:** Slightly dorsally constricted. **Ostium/cauda:** 1:1.8. **Collum:** Absent, step up to cauda. **Crista superior:** Moderately well developed or rounded ridge along entire sulcus. **Crista inferior:** Moderately well developed as rounded knob at neck and anterior cauda, poor under ostium. **Dorsal depression:** Elongate, approximately horizontal, covering most of dorsal area. **Ventral depression:** Entire ventral area depressed under crista. **Rostrum:** Large, broad and bluntly rounded. **Antirostrum:** Large, broad and bluntly rounded. **Excisura:** Wide, notch moderately deep, angle wide.

**BALISTIDAE Nelson No. 440**

**Family characteristics:** Seven species described. Otoliths very small and delicate, up to c. 2.8 mm OD. Shapes generally ovate, but irregular, rarely discoid. Heterosulcoid, with ostial or ostio-caudal openings. Sulcus very deep, usually with collum. Ostium and cauda flared, reduced and deep. Heteromorph or colliculi not visible.

## Key

- 1a. Otolith shape discoid; sulcus deep but collum absent; rostrum broad and sharply rounded, not tapered . . . . . *Balistapus undulatus* 263.2
- 1b. Otolith shape ovate; sulcus deep with distinct collum; rostrum tapered or elongate . . . . . 2
- 2a. Rostrum elongate with rounded tip; otolith axe-shaped; flattened ventral area smooth . . . . . *Canthidermis maculatus* 263.6
- 2b. Rostrum tapered and pointed; otolith ovate, not axe-shaped; ventral area depressed and irregular . . . . . 3
- 3a. Ventral margin of otolith distinctly keeled; rostrum narrow, elongate and pointed . . . . . *Rhinecanthus aculeatus* 263.13
- 3b. Ventral margin of otolith rounded, slightly keeled or flat; rostrum tapered and pointed . . . . . 4
- 4a. Sulcus opening ostio-caudal . . . . . 5
- 4b. Sulcus opening ostial . . . . . 6
- 5a. Crista inferior extends to posterior margin of otolith; ventral margin of otolith flat; floor of cauda not rugose . . . . . *Sufflamen chrysopterus* 263.16
- 5b. Crista inferior ends short of posterior margin of otolith; ventral margin of otolith oblique; floor of cauda rugose . . . . . *Sufflamen fraenatus* 263.17
- 6a. Dorsal margin of otolith rounded; antirostrum broad and sharply rounded; ventral area of otolith smooth or slightly crystalline . . . . . *Melichthys indicus* 263.7
- 6b. Dorsal margin of otolith emarginate anteriorly; antirostrum narrow, flexed dorsally; ventral area of otolith crystalline with elongate crystals . . . . . *Odonus niger* 263.10

### *Balistapus undulatus*, SSF No. 263.2 PLATE 147

**DISTRIBUTION:** Red Sea and Indo-West Pacific, south to Natal. Attains 30 cm.

**MATERIAL:** 1/1 (2.45 mm OD, 220 mm TL), 1230H; Red Sea; Id. TH.

**Otolith shape:** Discoid. **Thickness:** Thick. **Form:** - Mesial very convex, - Lateral slightly concave. **Dorsal margin:** Well rounded; sculpture, slightly irregular. **Ventral margin:** Rounded, may be notched and slightly irregular. **Posterior margin:** Slightly flattened and irregular. **Sulcus acusticus:** Ostio-caudal, heterosulcoid. **Colliculum:** Sulcus very deep, colliculi not visible. **Pseudocolliculum:** Absent. **Ostium:** Deep, very reduced, lying mainly along margin of rostrum. **Cauda:** Deep, with steep walls, notched ventrally and flexed. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1. **Collum:** Present, very low. **Crista superior:** Well developed over ostium and posterior cauda, low ridge over anterior cauda, opening onto posterior wall. **Crista inferior:** Well developed from ostium to flexion, ridge-like from flexion. **Dorsal depression:** Shallow groove over posterior crista. **Ventral depression:** Postero-ventral depression from caudal tip onto ventral margin along posterior margin. **Rostrum:** Large, broad and sharply rounded. **Antirostrum:** Large, broad and pointed. **Excisura:** Wide, notch deep, angle acute.

### *Canthidermis maculatus*, SSF No. 263.6 PLATE 147

**DISTRIBUTION:** All warm and temperate oceans. In this area from the mouth of the Orange River to Natal. Attains over 50 cm. **MATERIAL:** 1/1 (1.05 mm OD, 147 mm TL), PEM 15441 (RUSI 40559); Sardinia Bay; Id. MJS, PCH.

**Otolith shape:** Approximately ovate or axe-like. **Thickness:** Moderately thick. **Form:** - Mesial approximately flat, - Lateral approximately flat. **Lateral surface:** Elongate pit at nucleus.

**Dorsal margin:** Raised and slightly rounded; sculpture, slightly irregular. **Ventral margin:** Flat to sinuate and slightly irregular. **Posterior margin:** Slightly emarginate and slightly irregular. **Sulcus acusticus:** Ostio-caudal, heterosulcoid. **Colliculum:** Heteromorph, colliculi indented, margins raised. **Pseudocolliculum:** Absent. **Ostium:** Flared and narrow, lying along margin of rostrum, depressed in centre. **Cauda:** Flared, depressed in centre. **Ostio-caudal differentiation:** Dorso-ventrally constricted. **Ostium/cauda:** 1:1. **Collum:** Absent. **Crista superior:** Poorly developed along entire sulcus. **Crista inferior:** Narrow high ridge from ostium to cauda. **Dorsal depression:** Shallow, near margin. **Ventral depression:** Entire ventral area depressed. **Rostrum:** Large, elongate and rounded. **Antirostrum:** Short, broad and rounded. **Excisura:** Wide, notch moderate, angle wide.

### *Melichthys indicus*, SSF No. 263.7 PLATE 147

**DISTRIBUTION:** Tropical Indian Ocean, south to Sodwana Bay. Attains c. 25 cm.

**MATERIAL:** 1/1 (2.15 mm OD, fish not measured), 0734H; Sodwana Bay; Id. PCH.

**Otolith shape:** Approximately ovate. **Thickness:** Moderately thick posteriorly, rostrum thin. **Form:** - Mesial convex, - Lateral concave. **Dorsal margin:** Slightly rounded; sculpture, slightly irregular. **Ventral margin:** Slightly rounded, angled anteriorly and slightly irregular. **Posterior margin:** Flat or slightly rounded and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** Colliculi not visible. **Pseudocolliculum:** Small, below collum. **Ostium:** Deep, flared, very reduced, narrow and lying mainly on rostrum. **Cauda:** Rounded, deepest closest to collum. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:0.5. **Collum:** Low, wall-like. **Crista superior:** Well developed along length of sulcus. **Crista inferior:** Well developed. **Dorsal depression:** Absent, area rough and crystalline. **Ventral depression:** Absent. **Rostrum:** Large, tapering and pointed, dorsal edge curves laterally. **Antirostrum:** Large, broad and sharply rounded. **Excisura:** Wide, notch deep, angle acute.

### *Odonus niger*, SSF No. 263.10 PLATE 147

**DISTRIBUTION:** Widespread in tropical Indo-West Pacific, south to Durban rarely to Port Alfred. Attains 50 cm.

**MATERIAL:** 1/1 (2.75 mm OD, 33 mm TL), 0733H; Sodwana Bay; Id. PCH.

**Otolith shape:** Ovate. **Thickness:** Moderately thick posteriorly, rostrum thin. **Form:** - Mesial convex, - Lateral flat. **Dorsal margin:** Raised posteriorly, emarginate anteriorly; sculpture, irregular. **Ventral margin:** Slightly rounded and irregular. **Posterior margin:** Slightly rounded or flat and slightly irregular. **Sulcus acusticus:** Ostial, heterosulcoid. **Colliculum:** No colliculi visible. **Pseudocolliculum:** Absent. **Ostium:** Deep, reduced, flared and lying mainly on rostrum. **Cauda:** Flared with broadly rounded tip close to posterior margin, deepest close to collum. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:0.5. **Collum:** Low, wall-like. **Crista superior:** Well developed, poorly developed near caudal tip. **Crista inferior:** Well developed under ostium, ridge-like under cauda to tip. **Dorsal depression:** Absent. **Ventral depression:** Slit-like, irregular groove under crista. **Rostrum:** Large, tapering and pointed, curves laterally. **Antirostrum:** Large, tapering and pointed, dorsally flexed. **Excisura:** Wide, notch deep, angle acute.

### *Rhinecanthus aculeatus*, SSF No. 263.13 PLATE 147

**DISTRIBUTION:** Common in tropical Indo-West Pacific, south to Algoa Bay. Attains 30 cm.

**MATERIAL:** 1/1 (1.5 mm OD, 68 mm TL), PEM 7705 (RUSI 28476); ORI; Id. PCH.



**Otolith shape:** Ovate, deeply keeled ventrally. **Thickness:** Moderately thin, rostrum thin. **Form:** - Mesial convex, Lateral slightly concave or flat. **Dorsal margin:** Slightly rounded; **sculpture,** irregular. **Ventral margin:** Keeled and irregular. **Posterior margin:** Emarginate and irregular. **Sulcus acusticus:** Ostio-caudal, heterosulcoid. **Colliculum:** No colliculi visible. **Pseudocolliculum:** Absent. **Ostium:** Deep and reduced, mainly on rostrum. **Cauda:** Flared, deepest at collum. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted. **Ostium/cauda:** 1:0.8. **Collum:** Low, wall-like. **Crista superior:** Well developed or irregular ridge, absent over posterior cauda. **Crista inferior:** Well developed or ridge-like, poorly developed near tip. **Dorsal depression:** Absent, area uneven. **Ventral depression:** Shallow depression below crista. **Rostrum:** Elongate, tapered and pointed. **Antirostrum:** Short, broad and sharply rounded. **Excisura:** Wide, notch deep, angle acute.

#### *Sufflamen chrysopterus*, SSF No. 263.16 PLATE 147

**DISTRIBUTION:** Common in Indo-West Pacific, south to Durban. Attains 30 cm.

**MATERIAL:** 1/1 (1.85 mm OD, 138 mm TL), 1390H; Kosi Bay; Id. PCH.

**Otolith shape:** Approximately ovate (dorsal margin broken). **Thickness:** Moderately thin. **Form:** - Mesial convex, - Lateral flat. **Dorsal margin:** Raised posteriorly, damaged anteriorly; **sculpture,** irregular. **Ventral margin:** Approximately flat and irregular. **Posterior margin:** Emarginate and irregular. **Sulcus acusticus:** Ostio-caudal, heterosulcoid. **Colliculum:** Heteromorph, depressed in centre, margins slightly raised. **Pseudocolliculum:** Absent. **Ostium:** Deep, flared and lies mainly on rostrum. **Cauda:** Flared, opens widely to posterior margin, deepest close to collum. **Ostio-caudal differentiation:** Slightly dorsally constricted. **Ostium/cauda:** 1:1.2. **Collum:** Low and wall-like. **Crista superior:** Narrow ridge along entire sulcus. **Crista inferior:** Narrow ridge along entire sulcus. **Dorsal depression:** Deep, above crista. **Ventral depression:** Entire ventral area depressed. **Rostrum:** Large, tapering and pointed. **Antirostrum:** Small and sharply rounded. **Excisura:** Wide, notch moderate, angle wide.

#### *Sufflamen fraenatus*, SSF No. 263.17 PLATE 147

**DISTRIBUTION:** Indo-West Pacific, south to Natal. Attains nearly 40 cm.

**MATERIAL:** 1/1 (1.6 mm OD, 189 mm TL), 0952H; Eilat, Israel; Id. tentative, IP.

**Otolith shape:** Triangular-ovate. **Thickness:** Thin. **Form:** - Mesial convex, - Lateral flat. **Dorsal margin:** Raised posteriorly; **sculpture,** very irregular. **Ventral margin:** Slightly keeled and irregular. **Posterior margin:** Approximately flat and irregular. **Sulcus acusticus:** Ostio-caudal, heterosulcoid. **Colliculum:** Heteromorph, indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Flared, mainly on rostrum, deep at collum. **Cauda:** Flared, ventral wall of cauda foreshortened, larger area than ostium, floor slightly rugose. **Ostio-caudal differentiation:** Slightly dorso-ventrally constricted on inner wall of crista. **Ostium/cauda:** 1:1. **Collum:** Low, wall-like. **Crista superior:** Ridge-like over entire sulcus, curves dorsally over posterior cauda. **Crista inferior:** Ridge-like, uneven, absent at postero-ventral edge. **Dorsal depression:** Large, most of dorsal area depressed and irregular. **Ventral depression:** Ventral area depressed and irregular. **Rostrum:** Moderately large, tapering and pointed. **Antirostrum:** Small and sharply rounded. **Excisura:** Wide, notch moderate, angle wide.

### BALISTIDAE Nelson No. 440 (MONACANTHIDAE in SSF)

**Family characteristics:** Four species described. Otoliths somewhat similar to those of Oreosomatidae, although generally smaller. Approximately hour-glass in shape, very small, up to c. 1.8 mm OD. Homosulcoid with ostio-caudal opening. Ostium and cauda flared with homomorph or indistinct colliculi.

#### Key

- 1a. Otolith shape triangular to hour-glass; dorsal and ventral margins of otolith rounded and almost entire; most of ventral area flat and depressed . . . . . *Aluterus monoceros* 264.1
- 1b. Otolith shape hour-glass to ovate; dorsal and ventral margins of otolith rounded or flat and irregular; ventral area irregular . . . . . 2
- 2a. Dorsal margin of otolith rounded, slightly irregular; crista inferior a broad ridge, narrow anteriorly; ventral area of otolith irregular and uneven . . . . . *Cantherhines pardalis* 264.6
- 2b. Dorsal margin of otolith approximately flat, horizontal or angled, irregular or lobed . . . . . 3
- 3a. Dorsal margin of otolith flat, angled and lobed; crista inferior a broad ridge . . . . . *Thamnaconus modestoides* 264.16
- 3b. Dorsal margin of otolith approximately horizontal; crista inferior well developed but uneven . . . . . 4
- 4a. Colliculum homomorph; ostium and cauda not depressed; crista superior poorly developed . . . . . *Thamnaconus fajardoii* 264.15
- 4b. Colliculi indistinct; ostium and cauda deeply depressed near collum; crista superior ridge-like but with irregular breaks in it . . . . . *Pervagor janthinosoma* 264.11

#### *Aluterus monoceros*, SSF No. 264.1 PLATE 147

**DISTRIBUTION:** Worldwide in tropical/subtropical seas; from Saldanha Bay to Beira. Attains 75 cm.

**MATERIAL:** 4/6 (1.05-1.45 mm OD, 453-591 mm TL), PEM 15333, 14810, 15332 (RUSI 36884), 15331 (RUSI 36883); Algoa Bay; Id. MJS, MEA.

**Otolith shape:** Triangular to hour-glass. **Thickness:** Moderately thin. **Form:** - Mesial convex, - Lateral flat. **Dorsal margin:** Rounded; **sculpture,** approximately entire. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Strongly emarginate and irregular. **Sulcus acusticus:** Ostio-caudal, homosulcoid. **Colliculum:** Homomorph, very indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Larger than cauda, deepest closest to collum, widely flared. **Cauda:** Widely flared, deepest close to collum. **Ostio-caudal differentiation:** Dorsally constricted. **Ostium/cauda:** 1:1.1, 1:1.5, 1:0.7, 1:0.8. **Collum:** Low, wall-like. **Crista superior:** Usually ridge-like, diagonal over ostium and cauda, absent at neck, but degree of development variable. **Crista inferior:** Ridge-like under ostium and cauda. **Dorsal depression:** Dorsal area depressed in triangular shape, may penetrate cristae over collum. **Ventral depression:** Ventral area depressed, deepest under crista. **Rostrum:** Moderate, rounded or sharply rounded. **Antirostrum:** Absent or short and rounded. **Excisura:** Moderately wide, notch shallow, angle wide.

#### *Cantherhines pardalis*, SSF No. 264.6 PLATE 147

**DISTRIBUTION:** Tropical/subtropical Indo-West Pacific, south to Mossel Bay. Attains 20 cm.

**MATERIAL:** 1/1 (1.45 mm OD, 179 mm TL), 1008H; Eilat; Id. TH.

**Otolith shape:** Hour-glass. **Thickness:** Moderately thin. **Form:** - Mesial convex, - Lateral flat. **Dorsal margin:** Raised, slightly rounded; **sculpture,** slightly irregular. **Ventral margin:** Rounded and very irregular. **Posterior margin:** Deeply notched and irregular. **Sulcus acusticus:** Ostio-caudal, homosulcoid. **Colliculum:** Homomorph, indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Flares widely dorsally. **Cauda:** Flares widely dorsally and reduced. **Ostio-caudal differentiation:** Dorsally constricted. **Ostium/cauda:** 1:1.2. **Collum:** Low, wall-like. **Crista superior:** Uneven diagonal ridges over ostium and cauda. **Crista inferior:** Ridge-like becoming poorly developed at posterior cauda. **Dorsal depression:** Triangular above cristae with horizontal ridge. **Ventral depression:** Ventral area depressed and uneven. **Rostrum:** Large, broad and sharply rounded. **Antirostrum:** Short, broad and rounded. **Excisura:** Wide, notch deep, angle wide.

*Pervagor janthinosoma* (*P. melanocephalus* in SSF),  
SSF No. 264.11 PLATE 148

**DISTRIBUTION:** Tropical Indo-West Pacific. Attains 16 cm.  
**MATERIAL:** 4/4 (0.85-1.7 mm OD, 74-100 mm TL), 1009H, 0721H, PEM 2648, 7706 (RUSI 28480); ORI, Sodwana and Eilat; Id. MJS, PCH, TH.

**Otolith shape:** Hour-glass. **Thickness:** Moderately thin and delicate. **Form:** - Mesial convex, - Lateral flat. **Dorsal margin:** Flat; **sculpture,** slightly irregular. **Ventral margin:** Rounded, notched and irregular. **Posterior margin:** Notched and irregular. **Sulcus acusticus:** Ostio-caudal, homosulcoid. **Colliculum:** Homomorph, indistinct colliculi. **Pseudocolliculum:** Absent. **Ostium:** Reduced, widely flared dorsally. **Cauda:** Reduced, widely flared dorsally. **Ostio-caudal differentiation:** Dorso-ventrally constricted internally. **Ostium/cauda:** 1:1.2, 1:1, 1:1.2, 1:1.1. **Collum:** Wall-like. **Crista superior:** Ridge-like, variable with breaks in it. **Crista inferior:** Ridge-like, broad and uneven. **Dorsal depression:** Moderately deep from anterior to posterior margins. **Ventral depression:** Margin depressed, surface irregular. **Rostrum:** Broad, may be notched and pointed. **Antirostrum:** Short, broad and sharply rounded. **Excisura:** Wide, notch varies (deep or shallow) and angle wide.

*Thamnaconus fajardoi*, SSF No. 264.15 PLATE 148

**DISTRIBUTION:** Mauritius, Madagascar and southern Mozambique Channel. Attains 22 cm.

**MATERIAL:** 1/1 (1.8 mm OD, 191 mm TL), PEM 15007 (RUSI 35569); Transkei; Id. MJS, MEA.

**Otolith shape:** Hour-glass. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral convex. **Dorsal margin:** Raised, flat; **sculpture,** slightly irregular. **Ventral margin:** Slightly rounded and irregular. **Posterior margin:** Deeply notched and irregular. **Sulcus acusticus:** Ostio-caudal, homosulcoid. **Colliculum:** Homomorph, single fused colliculum. **Pseudocolliculum:** Absent. **Ostium:** Reduced, flared dorsally. **Cauda:** Flared, larger and deeper than ostium. **Ostio-caudal differentiation:** Dorsally constricted. **Ostium/cauda:** 1:1.1. **Collum:** Absent. **Crista superior:** Poorly developed along sulcus. **Crista inferior:** Well developed to ridge-like and uneven. **Dorsal depression:** Shallow, close to margin. **Ventral depression:** Ventral area unevenly depressed. **Rostrum:** Notched, broad and blunt. **Antirostrum:** Short, very broad and rounded. **Excisura:** Very wide, notch shallow, angle wide.

*Thamnaconus modestoides*, SSF No. 264.16  
PLATE 148

**DISTRIBUTION:** Indian Ocean, south to Algoa Bay; also north-western Australia and Japan. Attains 30 cm.

**MATERIAL:** 1/1 (1.35 mm OD, 150 mm TL), PEM 15563; Red Sea; Id. MJS, PCH.

**Otolith shape:** Hour-glass. **Thickness:** Thin and delicate. **Form:** - Mesial irregular, - Lateral slightly convex. **Lateral surface:** Depressed pit at nucleus. **Dorsal margin:** Flat but angled; **sculpture,** lobed. **Ventral margin:** Rounded and irregular. **Posterior margin:** Notched and irregular. **Sulcus acusticus:** Ostio-caudal, homosulcoid. **Colliculum:** Indistinct. **Pseudocolliculum:** Absent. **Ostium:** Flared and depressed. **Cauda:** Flared and depressed. **Ostio-caudal differentiation:** Dorso-ventrally constricted internally. **Ostium/cauda:** 1:1.3. **Collum:** Low and broad. **Crista superior:** Poorly developed along the entire sulcus. **Crista inferior:** Ridge-like, broad and uneven. **Dorsal depression:** Shallow, oval and large. **Ventral depression:** Ventral area under crista depressed. **Rostrum:** Broad and rounded, may be notched. **Antirostrum:** Short, broad and rounded. **Excisura:** Wide, notch moderately deep, angle wide.

OSTRACIIDAE Nelson No. 441

**Family characteristics:** Two species described. Otoliths very small, up to c. 1.5 mm OD. Tall-rectangular or -ovate shaped, archaesusulcoid or heterosulcoid with ostio-caudal openings. Sulcus slightly flared anteriorly, narrows posteriorly with deep pit in centre. Homomorph or heteromorph, colliculi may be indistinct.

**Key**

- 1a. Rostrum rounded; colliculum indistinct;  
crista superior absent . . . . . *Lactoria fornasini* 266.5
- 1b. Rostrum sharply rounded; colliculum with raised margin;  
crista superior well developed . . . . . *Ostracion cubicus* 266.6

*Lactoria fornasini*, SSF No. 266.5 PLATE 148

**DISTRIBUTION:** Tropical Indo-West Pacific, quite common along tropical east African coast. Attains 23 cm or more.

**MATERIAL:** 1/1 (1.0 mm OD, 63 mm TL), PEM 15396 (RUSI 40577); Bazaruto; Id. MJS, PCH.

**Otolith shape:** Tall-rectangular. **Thickness:** Moderate. **Form:** - Mesial approximately flat, - Lateral approximately flat. **Dorsal margin:** Flat or slightly rounded; **sculpture,** entire. **Ventral margin:** Flat, oblique and slightly irregular. **Posterior margin:** Slightly emarginate and slightly irregular. **Sulcus acusticus:** Ostio-caudal, archaesusulcoid. **Colliculum:** Homomorph, fused, indistinct colliculum with pit in centre. **Pseudocolliculum:** Absent. **Ostium and cauda:** Undifferentiated, sulcus slightly flared anteriorly, narrows posteriorly. **Ostio-caudal differentiation:** Absent. **Collum:** Absent. **Crista superior:** Absent. **Crista inferior:** Moderately well developed along the sulcus. **Dorsal depression:** Absent. **Ventral depression:** Ventral area slightly depressed. **Rostrum:** Short, broad and rounded. **Antirostrum:** Small, broad and rounded. **Excisura:** Moderate, notch shallow, angle wide.

*Ostracion cubicus*, SSF No. 266.6 PLATE 148

**DISTRIBUTION:** Indo-West Pacific and Red Sea, east coast to Knysna. Attains 45 cm.

**MATERIAL:** 1/1 (1.4 mm OD, 96 mm TL), 1006H; Eilat; Id. TH.

**Otolith shape:** Tall-ovate. **Thickness:** Moderate. **Form:** - Mesial convex, - Lateral flat or slightly convex. **Dorsal margin:** Slightly rounded; **sculpture,** slightly irregular. **Ventral margin:** Angled and irregular. **Posterior margin:** Flat, notched and irregular. **Sulcus acusticus:** Ostio-caudal, heterosulcoid. **Colliculum:** Heteromorph, margin raised, indented in colliculum centre, anterior and posterior fused. **Pseudocolliculum:** Absent. **Ostium:** Flared ventrally and deep. **Cauda:** Pit in anterior, shallow and narrow posteriorly. **Ostio-caudal differentiation:** Slightly ventrally constricted. **Ostium/cauda:** 1:1.1. **Collum:** Absent. **Crista superior:** Well developed along entire sulcus. **Crista inferior:** Poorly developed under ostium, well developed under cauda. **Dorsal depression:** Absent, area uneven. **Ventral depression:** Absent,



area uneven. **Rostrum:** Short, broad and sharply rounded. **Antirostrum:** Short, broad and rounded. **Excisura:** Moderately wide, notch moderate, angle wide.

#### TETRAODONTIDAE Nelson No. 443

**Family characteristics:** Eight species described. This family exhibits considerable ontogenetic and intraspecific variation in otolith shape, texture and development of features. A key is not provided as direct comparison with material and consultation of photographs is the best method of identification. Otoliths hour-glass shaped or tall-ovate, up to c. 2 mm OD. Sulcus pseudo-archaesulcoid with ostio-caudal openings. Colliculum fused, often with pits. Crista superior absent, crista inferior very high, ridge-like and broad.

#### *Amblyrhynchotes honckenii*, SSF No. 268.1 PLATE 148

**DISTRIBUTION:** Tropical Indo-West Pacific from South Africa to China, common from the Cape to Natal. Attains 30 cm.

**MATERIAL:** 7/11 (1.05-1.8 mm OD, 120-193 mm TL), 0597H, PEM 15050 (RUSI 35568), 15048, 0067, 15049, 15052, 15053; Cape south coast, Algoa Bay and Dwesa, Transkei; Id. MJS, GJBR, PCH, TH.

**Otolith shape:** Hour-glass. **Thickness:** Moderately thin. **Form:** - Mesial concave, - Lateral convex. **Dorsal margin:** Slightly rounded or flat; **sculpture,** slightly irregular. **Ventral margin:** Rounded and irregular. **Posterior margin:** Notched and irregular. **Sulcus acusticus:** Ostio-caudal, pseudo-archaesulcoid. **Colliculum:** Homomorph, single fused colliculum with anterior and posterior pits, may be hidden by raised crista inferior. **Pseudocolliculum:** Absent. **Ostium:** Pit in ostium usually larger than caudal pit. **Cauda:** Has colliculum with oval pit, opening into wide notch. **Ostio-caudal differentiation:** No constrictions. **Ostium/cauda:** 1:1.3, 1:1.2, 1:2, 1:0.6, 1:1.1, 1:1.5, 1:0.8. **Collum:** Colliculum between pits collum-like. **Crista superior:** Poorly or well developed. **Crista inferior:** Ridge-like, fan-like and uneven, may hide sulcus. **Dorsal depression:** Absent, area reduced. **Ventral depression:** Groove-like below crista. **Rostrum:** Small, narrow and pointed or sharply rounded. Note pseudo-rostrum blunter than rostrum. **Antirostrum:** Short, broad and sharply rounded. **Excisura:** Wide, notch deep, angle acute.

**NOTE:** Considerable intra-specific variation in texture of the surface and development of the features, even between left and right otoliths of the same specimen.

#### *Arothron hispidus*, SSF No. 268.2 PLATE 148

**DISTRIBUTION:** Tropical Indo-West Pacific, south to Knysna. Attains c. 50 cm.

**MATERIAL:** 1/1 (1.4 mm OD, 168 mm TL), PEM 14845; ORI; Id. MJS.

**Otolith shape:** Approximately tall-ovate. **Thickness:** Moderately thin and delicate. **Form:** - Mesial flat or slightly concave, - Lateral slightly convex. **Dorsal margin:** Rounded; **sculpture,** serrate or very irregular. **Ventral margin:** Well rounded, serrate or irregular. **Posterior margin:** Emarginate and irregular. **Sulcus acusticus:** Ostio-caudal, pseudo-archaesulcoid. **Colliculum:** Homomorph, single fused colliculum, very irregular with anterior and posterior pits. **Pseudocolliculum:** Absent. **Ostium:** Flared on rostrum, deep with pit dorsal to colliculum. **Cauda:** Flared, with pit dorsal to collicular pit. **Ostio-caudal differentiation:** No constrictions. **Ostium/cauda:** 1:0.8. **Collum:** Colliculum between pits is collum-like. **Crista superior:** Poorly developed. **Crista inferior:** Ridge-like and broad, absent at extremes. **Dorsal depression:** Area uneven. **Ventral depression:** Groove-like depression under crista, area depressed. **Rostrum:** Elongate, tapering and pointed, curves dorsally. **Antirostrum:** Short, broad and rounded. **Excisura:** Wide, notch moderate, angle wide.

#### *Arothron stellatus*, SSF No. 268.8 PLATE 149

**DISTRIBUTION:** Indo-West Pacific, occasionally reaches Knysna. Attains at least 90 cm.

**MATERIAL:** 1/1 (2.0 mm OD, 355 mm TL), PEM 14844; ORI; Id. MJS.

**Otolith shape:** Hour-glass. **Thickness:** Moderate but irregular and thin in centre. **Form:** - Mesial slightly convex, - Lateral flat or slightly convex. **Dorsal margin:** Flat or slightly rounded; **sculpture,** irregular. **Ventral margin:** Rounded and irregular. **Posterior margin:** Notched and irregular. **Sulcus acusticus:** Ostio-caudal, pseudo-archaesulcoid. **Colliculum:** Homomorph, colliculi with distinct walls but otherwise reduced. **Pseudocolliculum:** Absent. **Ostium:** Opens into narrow notch, flared. **Cauda:** Colliculum with deep pit, flares onto pseudo-rostrum. **Ostio-caudal differentiation:** No constrictions. **Ostium/cauda:** 1:1.2. **Collum:** Absent. **Crista superior:** Well developed or uneven ridge. **Crista inferior:** Ridge-like, broad and uneven along the entire sulcus. **Dorsal depression:** Absent, area uneven and reduced. **Ventral depression:** Groove-like, undercutting crista. **Rostrum:** Large, broad and blunt. **Antirostrum:** Broad and pointed. **Excisura:** Wide, notch moderate, angle wide.

#### *Canthigaster solandri*, SSF No. 268.15 PLATE 149

**DISTRIBUTION:** Hawaii, Indo-West Pacific south to Port Elizabeth. Attains 11 cm.

**MATERIAL:** 1/4 (1.1 mm OD, 108 mm TL), 1282H; Eilat; Id. TH.

**Otolith shape:** Hour-glass. **Thickness:** Moderately thin. **Form:** - Mesial concave, - Lateral convex. **Dorsal margin:** Slightly rounded; **sculpture,** slightly irregular. **Ventral margin:** Rounded, angled and irregular. **Posterior margin:** Notched and irregular. **Sulcus acusticus:** Ostio-caudal, pseudo-archaesulcoid. **Colliculum:** Heteromorph, indistinct and very low anterior and posterior colliculi. **Pseudocolliculum:** Absent. **Ostium:** Deep, flares widely onto rostrum, ending indistinctly posteriorly. **Cauda:** Narrow, short and distinguishable only by shape of narrow colliculum. **Ostio-caudal differentiation:** No constrictions. **Ostium/cauda:** 1:0.3. **Collum:** Absent. **Crista superior:** Well developed. **Crista inferior:** Broad, tapering, ridge-like along entire sulcus. **Dorsal depression:** Absent, dorsal area reduced. **Ventral depression:** Groove-like under crista, margin depressed. **Rostrum:** Broad, tapering and bluntly pointed. **Antirostrum:** Short, broad and rounded. **Excisura:** Wide, notch deep, angle acute.

#### *Lagocephalus ?guentheri*, SSF No. 268.19 PLATE 149

**DISTRIBUTION:** Known in this area from off Tugela River to Algoa Bay. If synonymy correct, also occurs of Brazil and Japan. Attains at least 41 cm.

**MATERIAL:** 2/2 (0.55, 1.1 mm OD, 98, 245 mm TL), 1393H, PEM 0438; Durban; Id. GJBR, OG.

**Otolith shape:** Hour-glass. **Thickness:** Moderately thin. **Form:** - Mesial concave, - Lateral slightly convex. **Dorsal margin:** Rounded or slightly rounded; **sculpture,** dentate or irregular. **Ventral margin:** Rounded and irregular. **Posterior margin:** Notched and entire. **Sulcus acusticus:** Ostio-caudal, heterosulcoid, becoming pseudo-archaesulcoid with growth of colliculum. **Colliculum:** Homomorph, single fused colliculum with anterior and posterior pits. **Pseudocolliculum:** Absent. **Ostium:** Flared, larger than cauda with pit anteriorly. **Cauda:** Less flared, with pit. **Ostio-caudal differentiation:** No constrictions. **Ostium/cauda:** 1:1.2, 1:1. **Collum:** Flat area present in juveniles (c. 0.5 mm OD), lost in adults with growth of colliculum. **Crista superior:** Poorly developed. **Crista inferior:** Ridge-like in mid-sulcus, absent at extremes. **Dorsal depression:** Absent, area reduced. **Ventral depression:** Margin depressed. **Rostrum:** Large, broad and



sharply rounded. **Antirostrum:** Short, broad and blunt. **Excisura:** Wide, notch moderately shallow, angle wide.

*Lagocephalus inermis*, SSF No. 268.20 PLATE 149

**DISTRIBUTION:** Indo-Pacific, south to Algoa Bay. Attains 56 cm.

**MATERIAL:** 1/1 (0.9 mm OD, 142 mm TL), 0035H; St Francis Bay; Id. TH.

**Otolith shape:** Hour-glass. **Thickness:** Moderately thin. **Form:** - Mesial concave, - Lateral slightly convex. **Dorsal margin:** Slightly rounded; **sculpture**, crenate or irregular. **Ventral margin:** Rounded and irregular. **Posterior margin:** Notched and slightly irregular. **Sulcus acusticus:** Ostio-caudal, pseudo-archae-sulcoid. **Colliculum:** Homomorph, anterior and posterior colliculi fused. **Pseudocolliculum:** Absent. **Ostium:** Flared widely dorsally with colliculum and pit within colliculum. **Cauda:** Elongate, irregular colliculum with pit and dip. **Ostio-caudal differentiation:** No constrictions. **Ostium/cauda:** 1:2.5. **Collum:** Absent. **Crista superior:** Very poorly developed. **Crista inferior:** Ridge-like, absent at extremes. **Dorsal depression:** Absent, area reduced. **Ventral depression:** Ventral area depressed and uneven. **Rostrum:** Short, broad and sharply rounded. **Antirostrum:** Short, very broad and sharply rounded. **Excisura:** Wide, notch moderately shallow, angle wide.

*Lagocephalus scleratus*, SSF No. 268.23 PLATE 149

**DISTRIBUTION:** Indo-West Pacific, also between Cape and Natal. Attains at least 85 cm.

**MATERIAL:** 2/2 (1.1, 1.5 mm OD, 135, 443 mm TL), 0034H, PEM 15375; Cape St Francis and St Francis Bay; Id. MJS, TH.

**Otolith shape:** Hour-glass. **Thickness:** Moderate. **Form:** - Mesial slightly concave, - Lateral slightly convex. **Dorsal margin:** Flat; **sculpture**, slightly irregular. **Ventral margin:** Rounded and slightly irregular. **Posterior margin:** Notched or flat and slightly irregular. **Sulcus acusticus:** Ostio-caudal, pseudo-archae-sulcoid. **Colliculum:** Homomorph, fused colliculi. **Pseudocolliculum:** Absent. **Ostium:** Elongate, pit in colliculum, opens into narrower notch than cauda. **Cauda:** Flares, elongate and has pit. **Ostio-caudal differentiation:** No constrictions. **Ostium/cauda:** 1:0.8, 1:0.7. **Collum:** Absent. **Crista superior:** Absent. **Crista inferior:** Ridge-like in mid-sulcus, absent at extremes. **Dorsal depression:** Absent, area very reduced. **Ventral depression:** Groove-like under crista, margin depressed. **Rostrum:** Broad, elongate and pointed. **Antirostrum:** Very broad, short and rounded. **Excisura:** Wide, notch moderate, angle acute.

*Sphaeroides pachygaster*, SSF No. 268.25 PLATE 149

**DISTRIBUTION:** Circumglobal, a deep water species from the Cape to Beira. Attains 26 cm.

**MATERIAL:** 5/10 (0.8-1.0 mm OD, 171-302 mm TL), PEM 15043 (RUSI 35577), 15041, 15042, 15044, 15058; Cape south coast; Id. MJS, PCH.

**Otolith shape:** Hour-glass. **Thickness:** Moderate. **Form:** - Mesial concave, - Lateral convex. **Dorsal margin:** Rounded or lobed; **sculpture**, entire. **Ventral margin:** Rounded, crenate or irregular. **Posterior margin:** Notched and slightly irregular. **Sulcus acusticus:** Ostio-caudal, pseudo-archae-sulcoid. **Colliculum:** Homomorph, fused colliculum with pit in centre. **Pseudocolliculum:** Absent. **Ostium:** Elongate raised colliculum, angled dorsally, may penetrate the excisura. **Cauda:** Flares with pit in anterior of colliculum, opens onto more notched posterior margin. **Ostio-caudal differentiation:** No constrictions. **Ostium/cauda:** 1:1.4, 1:1.6, 1:2.6, 1:2.4, 1:2. **Collum:** Absent. **Crista superior:** Absent. **Crista inferior:** Ridge-like, short and wide under ostium and neck, absent under posterior cauda. **Dorsal depression:** Absent, area reduced. **Ventral depression:** Ventral area depressed.

**Rostrum:** Short, broad and rounded or sharply rounded. **Antirostrum:** Absent or broad and blunt. **Excisura:** Wide, notch if present, very shallow, angle wide.

DIODONTIDAE Nelson No. 444

**Family characteristics:** Based on the single specimen available, otoliths tall, approximately oval, up to c. 3 mm OD. Pseudo-archae-sulcoid with ostio-caudal openings. Homomorph, fused colliculum with anterior and posterior pits. Excisura wide, notch very shallow.

*Diodon hystrix*, SSF No. 269.6 PLATE 149

**DISTRIBUTION:** Tsitsikamma Coastal National Park to Umtata River; probably all along our coasts. Circumtropical. Attains 60 cm or more.

**MATERIAL:** 1/1 (2.4 mm OD, 240 mm TL), 0033H; St Francis Bay; Id. TH.

**Otolith shape:** Tall oval or discoid. **Thickness:** Moderate. **Form:** - Mesial slightly concave, - Lateral slightly convex. **Dorsal margin:** Rounded; **sculpture**, dentate or irregular. **Ventral margin:** Rounded and irregular. **Posterior margin:** Flat or slightly rounded and irregular. **Sulcus acusticus:** Ostio-caudal, pseudo-archae-sulcoid. **Colliculum:** Homomorph with fused, irregular colliculum. **Pseudocolliculum:** Absent. **Ostium:** Poorly defined with shallow pit, colliculum well developed ventrally. **Cauda:** Flared posteriorly to margin, colliculum with deep pit and well developed ventrally. **Ostio-caudal differentiation:** No constrictions. **Ostium/cauda:** 1:1.5. **Collum:** Absent. **Crista superior:** Absent. **Crista inferior:** Ridge-like and uneven. **Dorsal depression:** Absent, dorsal area reduced. **Ventral depression:** Ventral area with irregular depressions. **Rostrum:** Absent or minute, very broad and rounded. **Antirostrum:** Absent or minute, broad and rounded. **Excisura:** Wide, notch, if present, very shallow and angle acute.

ACKNOWLEDGEMENTS

This atlas was made possible by the assistance of dozens of fishers who donated specimens, and numerous colleagues from several institutions who contributed material or expertise. Dr G.J.B. Ross initiated the Port Elizabeth Museum collection of otoliths in 1972 on realising the importance of these structures in prey identification. His interest was encouraged by the late John Fitch who also contributed several specimens to our collection.

Numerous local workers contributed significantly to this study. Dr P.C. Heemstra of the J.L.B.S.II donated numerous otoliths, checked thousands of fish identifications and invited us to participate in collecting expeditions. The late Prof. M.M. Smith, Dr M.E. Anderson and O.Gon confirmed identifications. Other members of the institute, particularly B. Ranchod, E. Matama and J.Holiday, assisted in locating RUSI specimens. Dr P.A. Hulley of the SAM contributed otolith material from several cruises, allowed us to remove otoliths from numerous specimens and identified hundreds of fishes, particularly the Myctophidae. Dr L.J.V. Compagno, Mss. L. Hoensen, M. van der Merwe and Mr C. Goliath helped on cruises or ashore locating specimens in their collection. Dr T. Iwamoto visited South Africa in 1992 and, with M.E. Anderson, resolved numerous problems with the Macrouridae. He kindly checked numerous voucher specimens and either verified their identification or corrected misidentifications.

R.P. van der Elst, S. Chater, P. Garrett, J. Ballard and S. Fennessy of the ORI saved hundreds of subtropical and



tropical fish for the otolith collection and the JLBSI. Dr L.E. Beckley contributed material from intertidal collections of fish.

Staff and students of the DIFS, RU have contributed in various ways. Dr M. Griffiths kindly checked the collections for the two kob species and provided information on their otoliths. Prof. D. Cyrus, Dr Kothaus, Prof. Lev Fishelson, Daniel Pelicier and numerous others have contributed material or assistance to our collections.

Mzi Winston Mahola removed and labeled thousands of otoliths over the past 12 years and his enthusiasm and care have allowed a large series of some species to be collected. Without his help, the Port Elizabeth Museum collection would have been much poorer. Dr C.D. Buxton, J.R. Clarke, M. du Plessis, A. Garai, M. De Klerk and particularly J. Liebenberg, contributed to the collection or assisted with aspects of this atlas. Mrs Debbie Gadd helped with checking information. Dr H.M. Kok helped in early computerization of the collection and Dr N.T. Klages contributed to some of the computerization in this project. We thank D.J.L. Venter of UPE for help in computer sorting the catalogues and regression calculations.

The Museum collection was augmented significantly from cruises undertaken aboard the *FRS Africana*, particularly during routine hake biomass surveys on the Cape west and south coasts, and experimental trawling. We thank the Director of the SFRI for permission to participate in these cruises. Numerous scientists, particularly Drs A.I.L. Payne, A. Badenhorst, R. Leslie and D. Japp, B. Rose, P. Simms, S. du Plessis, numerous technicians and crew helped with collection of material aboard.

The micrographs used in this atlas were all done at the RU Electron Microscopy Unit. We are grateful to R.H.M. Cross, S.C. Pinchuck and N. J. Cannon for their help in providing an excellent service.

Funding was provided for the first three years by the Foundation for Research Development through the Linefish Programme. Thereafter World Wide Fund For Nature South Africa (formerly Southern African Nature Foundation) funded the project from donations from Grinaker Holdings and Sports Mark. This financial support is gratefully acknowledged.

We thank Drs P.C. Heemstra and M.A. Raath for constructive comments on the manuscript, Elaine Heemstra for the final rendition of illustrations and Marion Baxter for her patience and help with page layout.

The Director, Dr Mike Raath, and PEM Board of Trustees are thanked for the additional support and funding they provided which allowed the completion of this project. Costs of printing were largely borne by FRD and Grinaker Holdings. Coastal Paper provided advice and help with paper procurement.

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*Seriola rivoliana*, Carangidae, PL74, P126  
*Seriolina nigrofasciata*, Carangidae, PL74, P126  
*Serranus cabrilla*, Serranidae, PL62, P108  
*Serrivomer beanii*, Serrivomeridae, PL5, P19  
*Serrivomer sp. A*, Serrivomeridae, PL5, P19  
*Setarches guentheri*, Scorpaenidae, PL51, P93  
*Siganus argenteus*, Siganidae, PL132, P212  
*Siganus stellatus*, Siganidae, PL132, P213  
*Siganus sutor*, Siganidae, PL132, P213  
*Sillago chondropus*, Sillaginidae, PL68, P117  
*Sillago sihama*, Sillaginidae, PL68, P117  
*Sio nordenskjoeldii*, Melamphaidae, PL44, P83  
*Solea bleekeri*, Soleidae, PL146, P229  
*Solea fulvomarginata*, Soleidae, PL146, P229  
*Sorsogona prionota*, Platycephalidae, PL54, P97  
*Sparodon durbanensis*, Sparidae, PL91, P150  
*Sphagemacrurus pumiliceps*, Macrouridae, PL32, P64  
*Sphoeroides pachygaster*, Tetraodontidae, PL149, P234  
*Sphyaena acutipinnis*, Sphyaenidae, PL112, P182  
*Sphyaena chrysotaenia*, Sphyaenidae, PL112, P182  
*Sphyaena flavicauda*, Sphyaenidae, PL112, P182  
*Sphyaena forsteri*, Sphyaenidae, PL112, P183  
*Sphyaena jello*, Sphyaenidae, PL113, P183  
*Sphyaena putnamiae*, Sphyaenidae, PL113, P183  
*Spicara australis*, Centrarchidae, PL91, P150  
*Spicara axillaris*, Centrarchidae, PL91-92, P151  
*Spondyllosoma emarginatum*, Sparidae, PL91, P150  
*Sternoptyx diaphana*, Sternoptychidae, PL12, P30  
*Stethojulis albovittata*, Labridae, PL117, P190  
*Stethojulis interrupta*, Labridae, PL117, P190  
*Stethojulis strigiventer*, Labridae, PL117, P190  
*Stomias boa boa*, Stomiidae, PL12, P31  
*Stromateus fiatola*, Stromateidae, PL138, P222  
*Sufflamen chrysopterus*, Balistidae, PL147, P231  
*Sufflamen fraenatus*, Balistidae, PL147, P231  
*Sufflogobius bibarbatus*, Gobiidae, PL129, P208  
*Symbolophorus barnardi*, Myctophidae, PL26, P54  
*Symbolophorus boops*, Myctophidae, PL26, P54  
*Symbolophorus evermanni*, Myctophidae, PL26, P54  
*Symbolophorus rufinus*, Myctophidae, PL26, P54  
*Synagrops japonicus*, Percichthyidae, PL56, P100  
*Synagrops microlepis*, Percichthyidae, PL56, P101  
*Synanceia verrucosa*, Scorpaenidae, PL51, P93  
*Synaphobranchus affinis*, Synaphobranchidae, PL3, P16  
*Synaphobranchus kaupii*, Synaphobranchidae, PL3, P16  
*Synaptura marginata*, Soleidae, PL146, P229  
*Synapturichthys kleini*, Soleidae, PL146, P229  
*Synchiropus monacanthus*, Callionymidae, PL127, P205  
*Synodus indicus*, Synodontidae, PL15, P37  
*Synodus variegatus*, Synodontidae, PL15, P37  
*Taaningichthys bathyphilus*, Myctophidae, PL26, P55  
*Taenianotus triacanthus*, Scorpaenidae, PL50, P92  
*Terapon jarbua*, Teraponidae, PL64, P111  
*Terapon theraps*, Teraponidae, PL64, P111



*Tetragonurus cuvieri*, Tetragonuridae, PL137, P221  
*Thalassoma amblycephalum*, Labridae, PL117, P190  
*Thalassoma hebraicum*, Labridae, PL117, P190  
*Thalassoma lunare*, Labridae, PL117, P191  
*Thalassoma purpureum*, Labridae, PL118, P191  
*Thalassoma trilobatum*, Labridae, PL118, P191  
*Thamnaconus fajardoi*, Balistidae, PL148, P232  
*Thamnaconus modestoides*, Balistidae, PL148, P232  
*Thryssa setirostris*, Engraulidae, PL7, P23  
*Thryssa vitirostris*, Engraulidae, PL7, P23  
*Thunnus alalunga*, Scombridae, PL136, P218  
*Thunnus albacares*, Scombridae, PL136, P218  
*Thunnus maccoyii*, Scombridae, PL136, P219  
*Thunnus thynnus thynnus*, Scombridae, PL136, P219  
*Thyrsites atun*, Gempylidae, PL133, P214  
*Thyrsitoides marleyi*, Gempylidae, PL133, P214  
*Thysanophrys arenicola*, Platycephalidae, PL54, P98  
*Trachinocephalus myops*, Synodontidae, PL16, P37  
*Trachinotus africanus*, Carangidae, PL74, P127  
*Trachinotus botla*, Carangidae, PL74, P127  
*Trachipterus trachipterus*, Trachipteridae, PL39, P75  
*Trachonurus villosus*, Macrouridae, PL32, P64  
*Trachurus delagoa*, Carangidae, PL75, P127  
*Trachurus trachurus*, Carangidae, PL75, P127  
*Trachyrhamphus bicoarctatus*, Syngnathidae, PL48, P88  
*Trachyrincus scabrus*, Macrouridae, PL32, P64  
*Trachyscorpia capensis*, Scorpaenidae, PL51, P93  
*Trichiurus lepturus*, Trichiuridae, PL134, P215  
*Trigla lyra*, Triglidae, PL53, P95  
*Trigloporus lastoviza africanus*, Triglidae, PL53, P95  
*Trigonolampa miriceps*, Melanostomiidae, PL13, P34  
*Tripterodon orbis*, Ephippidae, PL99, P163  
*Tripterophycis gilchristi*, Moridae, PL28, P56  
*Tylosurus crocodilus crocodilus*, Belonidae, PL38, P74  
*Umbrina canariensis*, Sciaenidae, PL95, P157  
*Umbrina ronchus*, Sciaenidae, PL95, P157  
*Upeneus tragula*, Mullidae, PL97, P159  
*Upeneus vittatus*, Mullidae, PL97, P159  
*Uranoscopus archionema*, Uranoscopidae, PL120, P195  
*Uroconger lepturus*, Congridae, PL5, P18  
*Uropterygius micropterus*, Muraenidae, PL2, P14  
*Valamugil buchanani*, Mugilidae, PL112, P181  
*Valamugil robustus*, Mugilidae, PL112, P181  
*Valamugil seheli*, Mugilidae, PL112, P182  
*Variola albamarginata*, Serranidae, PL62, P108  
*Variola louti*, Serranidae, PL62, P108  
*Ventrifossa nasuta*, Macrouridae, PL32, P64  
*Vinciguerria lucetia*, Photichthyidae, PL12, P31  
*Winteria telescopa*, Opisthoproctidae, PL10, P26  
*Xenodermichthys copei*, Alepocephalidae, PL10, P27  
*Xenolepidichthys dalgleishi*, Grammicolepididae, PL46, P86  
*Xenopoclinus leprosus*, Clinidae, PL125, P201  
*Xiphasia setifer*, Blenniidae, PL127, P204  
*Xiphias gladius*, Xiphiidae, PL136, P219  
*Xyrichtys pavo*, Labridae, PL118, P191  
*Yongeichthys nebulosus*, Gobiidae, PL129, P208  
*Zanclus canescens*, Acanthuridae, PL132, P212  
*Zebrasoma gemmatum*, Acanthuridae, PL131, P211  
*Zebrasoma scopas*, Acanthuridae, PL131, P211  
*Zebrasoma veliferum*, Acanthuridae, PL132, P211  
*Zenion hololepis*, Macrourocyttidae, PL45, P84  
*Zenopsis conchifer*, Zeidae, PL45, P85  
*Zeus capensis*, Zeidae, PL45, P85  
*Zeus faber*, Zeidae, PL45, P85

**Table 1.** Regressions of otolith diameter (OD) against body mass (M), total length (TL), fork length (FL) and standard length (SL). The data were regressed using the form  $\ln y = \ln a + b \ln x$ , and  $\ln$  is the natural logarithm, where  $x = OD$ , and  $y = M, TL, FL$  or  $SL$ , respectively. Columns are: species, Smiths' Sea Fishes number, Nelson's number, minimum and maximum otolith diameter of each species, y axis, number in the regression, the correlation coefficient, probability, a and b values, and the maximum and minimum values used in that regression. \* indicates regressions of two species. *Argyrosomus hololepidotus* is in fact two species and *Johnius* spp. relates to the curve for *J. amblycephalus* and *J. dussumieri* combined, *Epigonus* cf. *robustus* is probably two species. See text and Smith & Heemstra (1986).

SPECIES	SSF No.	Nelson No.	OD (mm) MIN	OD (mm) MAX	Y axis	n	r	p	a	b	MIN (y) (mm/g)	MAX (y) (mm/g)
<i>Bassanago albescent</i>	40.3	62	6.40	11.50	InM	43	0.916	<0.001	-2.1867	3.9603	126.6	1980.0
					InTL	43	0.919	<0.001	4.1576	1.0912	449.0	960.0
					InSL	41	0.922	<0.001	4.1102	1.1023	430.0	945.0
<i>Conger wilsoni</i>	40.8	62	1.70	7.46	InM	18	0.977	<0.001	-2.4885	4.4879	1.0	880.0
					InTL	18	0.991	<0.001	3.6938	1.4885	96.0	855.0
<i>Diastobranchus capensis</i>	46.1	57	0.55	5.60	InM	50	0.970	<0.001	2.1401	3.2348	2.2	2050.0
					InTL	49	0.969	<0.001	5.4420	0.9364	158.0	1071.0
					InSL	50	0.968	<0.001	5.4239	0.9247	153.0	1046.0
<i>Synaphobranchus kaupii</i>	46.7	57	2.00	3.30	InM	45	0.593	<0.001	3.1000	1.7617	56.8	219.0
					InTL	40	0.600	<0.001	5.7375	0.4536	394.0	572.0
					InSL	45	0.519	<0.001	5.8017	0.3718	388.0	567.0
<i>Notocanthus sexspinis</i>	52.1	47	1.40	2.60	InM	62	0.735	<0.001	3.3225	2.3204	44.1	351.6
					InTL	51	0.784	<0.001	5.5182	0.7316	300.0	550.0
					InFL	28	0.720	<0.001	4.5889	0.6915	120.0	194.0
					InSL	31	0.586	<0.001	5.5275	0.7152	225.0	540.0
<i>Etrumeus whiteheadi</i>	54.2	69	1.80	4.80	InM	155	0.975	<0.001	-0.6938	3.5282	4.2	143.5
					InTL	154	0.976	<0.001	3.7965	1.1088	87.0	260.0
					InFL	151	0.967	<0.001	3.6459	1.1405	77.0	237.0
					InSL	156	0.973	<0.001	3.6018	1.1069	72.0	233.0
					InM	129	0.992	<0.001	-0.1225	3.3965	0.1	131.8
<i>Sardinops ocellatus</i>	54.12	69	0.50	4.60	InTL	133	0.990	<0.001	3.9583	1.0689	32.0	346.0
					InFL	131	0.992	<0.001	3.8777	1.0471	30.0	226.0
					InSL	133	0.992	<0.001	3.7865	1.0564	27.0	212.0
					InM	178	0.968	<0.001	-1.0158	2.8541	0.4	25.7
<i>Engraulis japonicus</i>	55.1	70	0.90	4.30	InTL	176	0.971	<0.001	3.7039	0.9137	42.0	157.0
					InFL	174	0.971	<0.001	3.6072	0.9221	31.0	144.0
					InSL	168	0.969	<0.001	3.4572	0.9812	36.0	134.0
					InM	15	0.830	<0.001	-1.1539	2.6598	9.5	24.6
					InTL	15	0.849	<0.001	3.6748	0.8121	111.0	144.0
<i>Thryssa setirostris</i>	55.5	70	3.75	4.90	InFL	15	0.709	0.003	3.8983	0.5853	106.0	130.0
					InSL	15	0.795	<0.001	3.5325	0.7550	89.0	116.0
					InM	10	0.882	<0.001	-4.6847	4.3818	11.9	89.0
					InTL	10	0.917	<0.001	2.7573	1.2494	124.0	235.0
<i>Thryssa vitirostris</i>	55.6	70	5.50	7.44	InFL	10	0.901	<0.001	2.4694	1.3413	107.0	203.0
					InSL	10	0.904	<0.001	2.3908	1.3319	97.0	190.0
					InM	25	0.988	<0.001	0.7456	3.3375	1.8	385.4
					InTL	25	0.988	<0.001	4.4773	1.0094	86.0	416.0
<i>Gonorynchus gonorynchus</i>	57.1	73	0.85	4.80	InFL	19	0.977	<0.001	4.4571	0.9913	90.0	400.0
					InSL	25	0.989	<0.001	4.3533	1.0180	78.0	370.0
					InM	44	0.982	<0.001	-4.0831	3.9832	1.8	362.0
					InTL	45	0.988	<0.001	2.4346	1.3122	53.0	370.0
<i>Galeichthys ater</i>	59.2	108	3.20	14.00	InFL	45	0.985	<0.001	2.3623	1.3015	48.0	325.0
					InSL	45	0.984	<0.001	2.1947	1.3362	42.0	301.0
					InM	64	0.989	<0.001	-4.6236	4.2773	1.1	790.0
					InTL	66	0.989	<0.001	2.3402	1.4017	49.0	435.0
<i>Galeichthys feliceps</i>	59.3	108	2.80	13.90	InFL	66	0.992	<0.001	2.2688	1.3736	45.0	375.0
					InSL	63	0.990	<0.001	2.1601	1.3823	41.0	345.0
					InM	17	0.818	<0.001	0.9374	3.0636	49.0	865.0
					InTL	17	0.869	<0.001	4.4917	0.9150	230.0	498.0
<i>Alepocephalus australis</i>	64.1	134	3.40	7.18	InFL	17	0.868	<0.001	4.3777	0.9325	210.0	465.0
					InSL	17	0.875	<0.001	4.2785	0.9534	200.0	447.0
					InM	17	0.899	<0.001	2.6275	3.0272	4.1	62.9
					InTL	14	0.866	<0.001	5.2685	0.9666	126.0	299.0
<i>Chauliodus sloani</i>	68.2	147	0.75	1.60	InFL	17	0.898	<0.001	5.2155	0.9303	122.0	285.0
					InSL	22	0.912	<0.001	5.2013	0.8546	120.0	276.0
					InM	65	0.961	<0.001	-1.1170	3.1636	12.0	147.0
					InTL	35	0.967	<0.001	3.9374	0.9549	156.0	326.0
<i>Photichthys argenteus</i>	73.4	146	2.10	6.70	InSL	66	0.972	<0.001	3.8109	0.9911	76.0	310.0
					InM	87	0.787	<0.001	-1.8326	3.0971	0.2	2.1
					InTL	85	0.851	<0.001	3.4062	0.8570	33.0	60.0
					InSL	90	0.869	<0.001	3.1557	0.9618	27.0	52.0
<i>Maurolicus muelleri</i>	75.1	145	1.20	2.40								



Table 1 cont.

SPECIES	SSF No.	Nelson No.	OD (mm) MIN	OD (mm) MAX	Y axis	n	r	p	a	b	MIN (y) (mm/g)	MAX (y) (mm/g)
<i>Chlorophthalmus punctatus</i>	76.9	154	3.50	5.30	lnM	44	0.854	<0.001	-3.4683	4.5849	10.1	81.8
					lnTL	39	0.903	<0.001	3.0920	1.3219	118.0	200.0
					lnFL	40	0.916	<0.001	3.0658	1.2788	111.0	180.0
					lnSL	44	0.875	<0.001	2.9362	1.3080	97.0	167.0
<i>Saurida undosquamis</i>	79.3	157	5.50	11.70	lnM	19	0.964	<0.001	-2.8555	3.4887	20.4	337.0
					lnTL	18	0.969	<0.001	3.0124	1.1711	145.0	350.0
					lnFL	19	0.968	<0.001	2.8918	1.1905	132.0	329.0
					lnSL	18	0.967	<0.001	2.8458	1.1717	123.0	297.0
<i>Bolinichthys supralateralis</i>	86.7	166	2.80	5.10	lnM	14	0.959	<0.001	-1.5410	2.9545	3.0	28.0
					lnTL	14	0.975	<0.001	3.2626	1.0032	68.0	135.0
					lnSL	16	0.966	<0.001	3.1763	0.9673	61.0	117.0
<i>Diaphus hudsoni</i>	86.20	166	3.10	5.70	lnM	23	0.937	<0.001	-2.1402	2.4870	2.1	5.1
					lnTL	15	0.921	<0.001	2.6163	1.2040	56.0	85.0
					lnFL	21	0.908	<0.001	2.8065	1.0085	52.0	73.0
					lnSL	24	0.959	<0.001	2.7179	1.0077	48.0	90.0
<i>Diaphus mollis</i>	86.28	166	1.42	5.20	lnSL	22	0.959	<0.001	2.9971	0.7922	25.8	79.0
<i>Electrona antarctica</i>	86.44	166	1.62	3.00	lnM	21	0.877	<0.001	-1.0926	3.3178	2.0	9.5
					lnTL	87	0.893	<0.001	3.5114	1.1105	41.0	115.0
					lnSL	111	0.902	<0.001	3.3677	1.1081	36.0	100.0
<i>Electrona carlsbergi</i>	86.45	166	3.10	3.50	lnSL	25	0.392	0.053	3.7235	0.4703	67.0	79.0
<i>Electrona risso</i>	86.47	166	2.70	4.60	lnM	9	0.982	<0.001	-3.7811	3.9285	1.0	9.0
					lnSL	13	0.935	<0.001	2.4764	1.1537	35.0	72.0
<i>Gymnoscopelus nicholsi</i>	86.53	166	5.30	6.22	lnSL	24	0.658	<0.001	3.5636	0.7847	128.0	153.0
<i>Gymnoscopelus piabilis</i>	86.58	166	4.30	6.40	lnM	34	0.845	<0.001	-2.7910	3.1981	6.0	27.0
					lnTL	20	0.882	<0.001	3.2514	0.9420	100.0	148.0
					lnFL	19	0.933	<0.001	2.4204	1.3508	99.0	135.0
					lnSL	34	0.823	<0.001	2.9374	1.0150	82.0	130.0
<i>Krefflichthys anderssoni</i>	86.64	166	1.10	1.90	lnSL	27	0.932	<0.001	3.3549	1.2493	33.0	66.0
					lnSL	27	0.932	<0.001	3.3549	1.2493	33.0	66.0
<i>Lampanyctodes hectoris</i>	86.72	166	1.70	2.70	lnM	97	0.878	<0.001	-2.5907	4.2197	0.5	5.4
					lnTL	97	0.902	<0.001	3.1988	1.2676	47.0	85.0
					lnFL	31	0.694	<0.001	3.2611	1.0594	51.0	75.0
					lnSL	103	0.900	<0.001	2.9403	1.3463	37.0	75.0
<i>Lampanyctus australis</i>	86.76	166	1.18	3.20	lnSL	18	0.983	<0.001	3.4661	1.1006	38.4	114.0
<i>Lampanyctus lepidolichnus</i>	86.79	166	0.90	2.40	lnM	11	0.856	<0.001	0.0856	3.0963	4.0	19.0
					lnSL	26	0.952	<0.001	3.6722	1.2476	36.9	119.0
<i>Lobianchia gemellarii</i>	86.93	166	4.90	7.40	lnSL	15	0.977	<0.001	1.6621	1.4679	55.0	98.8
<i>Scopelopsis multipunctatus</i>	86.118	166	2.19	3.00	lnSL	15	0.578	0.024	3.2828	0.7217	43.0	62.0
<i>Symbolophorus bamardi</i>	86.119	166	1.84	5.30	lnM	24	0.930	<0.001	-1.2835	2.4423	1.0	15.0
					lnTL	21	0.973	<0.001	3.4839	0.8183	53.0	117.0
					lnFL	17	0.979	<0.001	3.2942	0.8878	46.0	106.0
					lnSL	25	0.973	<0.001	3.2652	0.8475	43.0	109.0
<i>Symbolophorus boops</i>	86.120	166	1.92	6.20	lnM	41	0.808	<0.001	-0.8470	2.1726	9.8	24.0
					lnTL	37	0.841	<0.001	3.6919	0.7005	110.0	147.0
					lnFL	31	0.879	<0.001	3.5115	0.7546	99.0	131.0
					lnSL	42	0.940	<0.001	3.1372	0.9235	50.1	121.0
<i>Gaidropsarus capensis</i>	88.1	174	1.20	3.70	lnM	18	0.962	<0.001	-1.7043	4.4280	0.5	76.1
					lnTL	18	0.967	<0.001	3.4237	1.3866	40.0	194.0
					lnSL	18	0.956	<0.001	3.2919	1.3921	35.0	170.0
<i>Merluccius capensis</i>	89.4	175	2.30	32.00	lnM	256	0.995	<0.001	-3.8096	3.5359	0.7	4950.0
					lnTL	256	0.995	<0.001	2.7806	1.1337	49.0	850.0
					lnSL	231	0.994	<0.001	2.6422	1.1334	42.0	740.0
<i>Merluccius paradoxus</i>	89.5	175	4.00	27.00	lnM	56	0.995	<0.001	-4.5042	3.8570	3.0	3745.0
					lnTL	54	0.998	<0.001	2.6739	1.2045	79.0	720.0
					lnSL	56	0.997	<0.001	2.4537	1.2402	65.0	660.0
<i>Antimora rostrata</i>	90.1	171	6.80	14.20	lnM	23	0.965	<0.001	-8.8171	5.6461	7.5	548.6
					lnTL	14	0.964	<0.001	1.7042	1.6333	137.0	418.0
					lnSL	22	0.969	<0.001	1.8136	1.5416	127.0	377.0
<i>Lepidion capensis</i>	90.5	171	8.20	17.40	lnM	60	0.924	<0.001	-6.2038	4.6315	22.0	122.0
					lnTL	54	0.939	<0.001	2.3171	1.3719	160.0	486.0
					lnSL	60	0.919	<0.001	2.4362	1.2827	147.0	432.0
<i>Physiculus capensis</i>	90.7	171	5.80	10.30	lnM	25	0.961	<0.001	-5.2799	4.1194	5.5	83.6
					lnTL	23	0.955	<0.001	2.3623	1.2549	102.0	203.0
					lnSL	25	0.952	<0.001	2.2301	1.2677	85.0	180.0
<i>Tripteryphycis gilchristi</i>	90.9	171	5.90	9.10	lnM	29	0.678	<0.001	-1.9783	2.5938	9.7	57.0
					lnTL	28	0.831	<0.001	3.1031	1.0731	141.0	252.0
					lnSL	26	0.780	<0.001	3.2243	0.9808	135.0	235.0
<i>Caelorinchus braueri</i>	93.5	176	5.60	13.40	lnM	62	0.969	<0.001	-3.7675	3.5221	8.3	279.4
					lnTL	47	0.950	<0.001	3.3943	0.9837	147.0	404.0
					lnSL	40	0.960	<0.001	1.5793	1.3032	44.0	152.0
<i>Caelorinchus denticulatus</i>	93.7	176	4.80	12.86	lnM	16	0.873	<0.001	-1.8290	2.3141	5.3	89.0

Table 1 cont.

SPECIES	SSF No.	Nelson No.	OD (mm) MIN	OD (mm) MAX	Y axis	n	r	p	a	b	MIN (y) (mm/g)	MAX (y) (mm/g)
<i>Caelorinchus simorhynchus</i>	93.8	176	2.90	17.40	InTL	16	0.752	<0.001	3.8638	0.6511	121.0	321.0
					InSL	16	0.918	<0.001	-0.5358	2.4515	31.0	220.0
					InM	66	0.938	<0.001	-4.7557	3.9875	0.5	625.1
					InTL	55	0.959	<0.001	2.9046	1.1803	115.0	525.0
<i>Caelorinchus matamua</i>	93.16	176	9.30	14.40	InFL	31	0.893	<0.001	2.6499	1.2821	192.0	503.0
					InM	25	0.785	<0.001	-2.2784	3.4121	124.5	822.7
<i>Malacocephalus laevis</i>	93.17	176	5.00	18.50	InTL	25	0.783	<0.001	3.6729	1.0098	320.0	557.0
					InSL	12	0.755	0.004	2.2261	1.0859	97.0	159.0
					InM	37	0.982	<0.001	-6.2028	4.6692	8.5	1140.0
<i>Nezumia micronychodon</i>	93.22	176	4.20	10.20	InTL	17	0.941	<0.001	2.4895	1.4194	123.0	650.0
					InM	37	0.937	<0.001	-2.4306	3.2303	8.5	176.5
					InTL	17	0.926	<0.001	2.9072	1.2797	177.0	331.0
<i>Lucigadus ori</i>	93.32	176	4.80	7.50	InSL	18	0.885	<0.001	1.3166	1.3236	35.0	83.0
					InM	32	0.845	<0.001	-2.3545	2.8630	8.4	27.6
					InTL	32	0.822	<0.001	4.0144	0.7241	170.0	233.0
<i>Dicrolene intronigra</i>	96.5	177	2.40	7.60	InM	57	0.947	<0.001	-0.2819	2.6695	7.4	164.1
					InTL	57	0.919	<0.001	4.2356	0.7791	131.0	330.0
					InSL	54	0.949	<0.001	4.1626	0.7720	119.0	299.0
<i>Genypterus capensis</i>	96.9	177	6.20	21.24	InM	65	0.984	<0.001	-6.4094	5.2076	21.1	15000.0
					InTL	67	0.984	<0.001	2.3930	1.5630	188.0	1360.0
					InSL	31	0.985	<0.001	2.7349	1.3860	180.0	930.0
<i>Selachophidium guentheri</i>	96.22	177	4.60	10.40	InM	32	0.946	<0.001	-2.4004	3.2829	11.9	152.9
					InTL	44	0.857	<0.001	3.8552	0.8004	156.0	304.0
					InSL	32	0.899	<0.001	3.7459	0.8285	143.0	288.0
<i>Lophius vomennus</i>	101.4	182	1.20	11.74	InM	104	0.963	<0.001	-0.3543	3.8554	2.9	11000.0
					InTL	103	0.968	<0.001	3.6028	1.2790	58.0	900.0
					InSL	88	0.967	<0.001	3.4102	1.2594	45.0	735.0
<i>Chaunax pictus</i>	103.2	185	2.20	9.80	InM	13	0.929	<0.001	-1.2898	3.0332	3.8	652.2
					InTL	12	0.939	<0.001	3.1804	0.9846	49.0	260.0
					InSL	12	0.975	<0.001	2.8273	1.0279	37.0	201.0
<i>Haliutea fitzsimonsi</i>	104.2	186	2.65	8.90	InM	15	0.939	<0.001	-1.9546	3.0787	2.3	143.0
					InTL	15	0.957	<0.001	2.8941	1.0603	48.0	180.0
					InSL	15	0.955	<0.001	2.5723	1.1090	36.0	148.0
<i>Chorisochismus dentex</i>	110.2	198	0.40	1.90	InM	65	0.919	<0.001	2.4757	5.4499	0.2	327.6
					InTL	65	0.923	<0.001	4.4266	1.7149	21.0	235.0
					InSL	63	0.922	<0.001	4.2297	1.7135	18.0	200.0
<i>Atherina breviceps</i>	111.1	213	2.00	3.10	InM	27	0.836	<0.001	-1.4990	2.6643	1.2	5.2
					InTL	27	0.864	<0.001	3.4954	0.8378	56.0	89.0
					InFL	26	0.899	<0.001	3.3473	0.8991	51.0	81.0
<i>Scomberesox saurus</i>	114.2	203	1.20	2.40	InSL	27	0.877	<0.001	3.2527	0.8890	45.0	73.0
					InM	20	0.921	<0.001	1.9404	3.2056	11.1	114.6
					InTL	19	0.911	<0.001	4.9723	1.0298	165.0	348.0
<i>Hemiramphus far</i>	115.2	201	1.51	9.60	InFL	18	0.905	<0.001	4.9137	1.0288	155.0	330.0
					InSL	19	0.908	<0.001	4.8344	1.0636	144.0	311.0
					InM	32	0.971	<0.001	-0.8917	3.0080	1.1	421.4
<i>Hyporhamphus capensis</i>	115.4	201	2.00	3.12	InTL	31	0.968	<0.001	4.1385	0.9279	86.0	523.0
					InFL	31	0.973	<0.001	4.0802	0.9030	80.0	469.0
					InSL	32	0.972	<0.001	4.0001	0.9133	74.0	442.0
<i>Beryx splendens</i>	126.2	234	7.30	13.00	InM	20	0.917	<0.001	-0.8566	2.3307	1.8	7.2
					InTL	20	0.925	<0.001	4.2324	0.7447	109.0	165.0
					InFL	9	0.964	<0.001	4.1158	0.8176	111.0	160.0
<i>Hoplostethus atlanticus</i>	127.2	230	3.50	17.00	InSL	20	0.928	<0.001	4.1290	0.7361	98.0	147.0
					InM	40	0.955	<0.001	-6.8939	5.2332	32.9	775.6
					InTL	37	0.949	<0.001	1.7359	1.6228	142.0	368.0
<i>Hoplostethus mediterraneus</i>	127.4	230	3.70	10.20	InFL	35	0.970	<0.001	1.6282	1.5904	122.0	302.0
					InSL	40	0.959	<0.001	1.6009	1.5535	110.0	274.0
					InM	68	0.957	<0.001	0.0755	2.6679	19.3	2000.0
<i>Diretmus argenteus</i>	130.2	232	4.00	10.00	InTL	47	0.942	<0.001	3.8943	0.8074	160.0	450.0
					InFL	48	0.947	<0.001	3.5864	0.8751	130.0	401.0
					InSL	65	0.958	<0.001	3.4264	0.8935	94.0	353.0
<i>Zeus capensis</i>	138.4	245	1.15	3.10	InM	41	0.984	<0.001	-4.1068	3.7324	2.4	81.0
					InTL	44	0.985	<0.001	2.6239	1.1125	61.0	176.0
					InFL	29	0.964	<0.001	2.3748	1.1468	60.0	149.0
<i>Alloctytus verrucosus</i>	139.2	246	2.15	7.70	InSL	41	0.983	<0.001	2.2660	1.1370	45.0	130.0
					InM	17	0.992	<0.001	-3.1053	3.1983	3.9	70.0
					InTL	8	0.975	<0.001	2.3245	1.1079	43.0	129.0
<i>Alloctytus verrucosus</i>	139.2	246	2.15	7.70	InSL	18	0.987	<0.001	2.0225	1.1861	38.0	114.0
					InM	86	0.934	<0.001	1.3260	5.3045	3.1	4230.0
					InTL	86	0.928	<0.001	4.1536	1.8033	58.0	640.0
<i>Alloctytus verrucosus</i>	139.2	246	2.15	7.70	InSL	86	0.933	<0.001	3.8976	1.8401	49.0	520.0
					InM	57	0.952	<0.001	1.2203	2.9898	29.6	1152.6



Table 1 cont.

SPECIES	SSF No.	Nelson No.	OD (mm) MIN	OD (mm) MAX	Y axis	n	r	p	a	b	MIN (y) (mm/g)	MAX (y) (mm/g)
<i>Neocyttus rhomboidalis</i>	139.3	246	2.30	6.10	InTL	56	0.952	<0.001	3.8561	1.0520	109.0	360.0
					InSL	54	0.951	<0.001	3.6589	1.0583	88.0	296.0
					InM	80	0.908	<0.001	1.1548	3.1745	37.9	948.5
					InTL	77	0.901	<0.001	3.9818	1.0245	115.0	355.0
<i>Oreosoma atlanticum</i>	139.4	246	2.40	3.40	InSL	77	0.907	<0.001	3.7459	1.0521	97.0	241.0
					InM	20	0.850	<0.001	1.0119	3.3968	51.3	148.3
					InTL	20	0.866	<0.001	3.9580	1.0845	130.0	191.0
<i>Macroramphosus scolopax</i>	147.2	256	0.50	1.35	InSL	20	0.874	<0.001	3.6456	1.1840	103.0	158.0
					InM	25	0.829	<0.001	1.6579	3.3982	0.7	24.9
					InTL	25	0.836	<0.001	4.5161	1.1802	48.0	163.0
<i>Scorpaena scrofa</i>	149.21	262	9.60	16.50	InSL	17	0.797	<0.001	4.3807	1.4884	43.0	146.0
					InM	14	0.918	<0.001	-3.0782	3.6688	158.4	1395.0
					InTL	17	0.920	<0.001	2.2489	1.3805	204.0	459.0
<i>Helicolenus dactylopterus</i>	149.42	262	1.50	14.80	InSL	17	0.917	<0.001	1.9004	1.4152	156.0	365.0
					InM	171	0.982	<0.001	-3.2748	3.8463	0.2	1300.0
					InTL	195	0.977	<0.001	2.6947	1.2357	28.0	430.0
					InFL	31	0.897	<0.001	2.7294	1.1890	132.0	310.0
<i>Trachyscorpia capensis</i>	149.44	262	4.10	17.00	InSL	189	0.974	<0.001	2.4465	1.2453	21.0	360.0
					InM	49	0.984	<0.001	-4.8178	4.2954	6.1	1050.0
					InTL	48	0.983	<0.001	2.2304	1.3519	75.0	388.0
<i>Coccotropsis gymnoderma</i>	150.2	262	0.60	1.95	InSL	49	0.987	<0.001	1.9467	1.3831	60.0	319.0
					InM	26	0.958	<0.001	-1.4448	2.6628	0.0	1.5
					InTL	26	0.985	<0.001	3.1226	0.9211	14.0	43.0
<i>Congiopodus spinifer</i>	152.1	267	2.30	5.40	InSL	26	0.979	<0.001	2.8698	0.9303	11.0	34.0
					InM	45	0.919	<0.001	-0.0974	3.5938	10.5	362.3
					InTL	46	0.923	<0.001	3.7990	1.1698	98.0	316.0
<i>Chelidonichthys capensis</i>	157.1	268	0.70	9.00	InSL	46	0.922	<0.001	3.5795	1.1951	82.0	268.0
					InM	110	0.989	<0.001	-0.6257	4.1191	0.2	2990.0
					InTL	111	0.989	<0.001	3.6942	1.3392	26.0	640.0
					InFL	102	0.988	<0.001	3.7090	1.2954	25.0	615.0
<i>Chelidonichthys kumu</i>	157.2	268	2.10	5.50	InSL	110	0.989	<0.001	3.4589	1.3564	21.0	530.0
					InM	30	0.960	<0.001	-0.0298	3.5007	6.8	425.0
					InTL	30	0.965	<0.001	3.8289	1.1816	87.0	352.0
					InFL	24	0.956	<0.001	3.7446	1.2066	85.0	336.0
<i>Chelidonichthys queketti</i>	157.3	268	1.65	4.90	InSL	30	0.965	<0.001	3.6007	1.1972	70.0	288.0
					InM	80	0.911	<0.001	0.1970	3.5615	6.8	371.9
					InTL	80	0.904	<0.001	3.9901	1.0576	91.0	342.0
					InFL	48	0.872	<0.001	3.8791	1.1905	89.0	331.0
<i>Peristedion weberi</i>	158.1	268	1.80	4.60	InSL	80	0.903	<0.001	3.7635	1.1811	74.0	283.0
					InM	22	0.986	<0.001	-1.3252	3.1431	1.7	32.8
					InTL	23	0.984	<0.001	3.6197	1.0884	71.0	199.0
					InFL	18	0.947	<0.001	3.6380	1.0579	124.0	194.0
<i>Satyrichthys adeni</i>	158.2	268	2.50	5.50	InSL	23	0.984	<0.001	3.4720	1.1065	62.0	178.0
					InM	14	0.850	<0.001	-1.6530	4.4807	62.4	605.3
					InTL	15	0.963	<0.001	3.4109	1.4800	112.0	397.0
					InFL	11	0.806	<0.001	3.9459	1.0995	223.0	357.0
<i>Psychrolutes macrocephalus</i>	160.4	279	3.00	7.10	InSL	15	0.957	<0.001	3.2950	1.4677	98.0	347.0
					InM	47	0.958	<0.001	-6.4886	6.8433	3.2	735.3
					InTL	38	0.943	<0.001	1.7197	2.0775	58.0	300.0
					InSL	44	0.960	<0.001	1.4486	2.1144	49.0	257.0
<i>Acanthistius sebastoides</i>	166.1	284	1.70	11.76	InM	68	0.992	<0.001	-2.8205	3.5773	0.6	497.0
					InTL	68	0.993	<0.001	2.7214	1.1688	32.0	291.0
					InSL	67	0.992	<0.001	2.4991	1.1758	26.0	237.0
<i>Anthias squamipinnis</i>	166.9	284	1.30	4.10	InM	12	0.993	<0.001	-2.1536	3.5808	0.3	21.5
					InTL	19	0.977	<0.001	3.0585	1.2210	30.0	133.0
					InFL	20	0.981	<0.001	2.9034	1.1902	25.0	103.0
<i>Cephalopholis sonnerati</i>	166.29	284	5.00	12.00	InSL	19	0.987	<0.001	2.6723	1.2466	20.0	86.0
					InM	25	0.949	<0.001	-4.6817	4.8982	38.6	1630.0
					InTL	25	0.947	<0.001	2.2345	1.5668	132.0	465.0
					InSL	25	0.948	<0.001	1.9417	1.6084	105.0	388.0
<i>Epinephelus andersoni</i>	166.34	284	9.50	17.40	InM	12	0.975	<0.001	-4.3627	4.3663	205.3	2600.0
					InTL	35	0.967	<0.001	2.1100	1.5466	260.0	751.0
					InSL	33	0.963	<0.001	1.8546	1.5628	208.0	615.0
<i>Epinephelus fasciatus</i>	166.39	284	6.10	10.40	InM	34	0.935	<0.001	-3.9640	4.5538	70.0	738.9
					InTL	40	0.924	<0.001	2.5257	1.4586	177.0	371.0
					InSL	40	0.923	<0.001	2.2618	1.4849	142.0	305.0
<i>Epinephelus marginatus</i>	166.43	284	3.33	18.34	InM	31	0.985	<0.001	-3.2248	4.1484	28.4	9800.0
					InTL	39	0.989	<0.001	2.7609	1.3124	91.0	800.0
					InSL	35	0.989	<0.001	2.4517	1.3610	73.0	695.0
<i>Epinephelus rivulatus</i>	166.60	284	4.70	11.40	InM	14	0.973	<0.001	0.1985	2.5411	61.8	542.8
					InTL	40	0.945	<0.001	3.4641	0.9825	156.0	388.0

Table 1 cont.

SPECIES	SSF No.	Nelson No.	OD (mm) MIN	OD (mm) MAX	Y axis	n	r	p	a	b	MIN (y) (mm/g)	MAX (y) (mm/g)
<i>Priacanthus cruentatus</i>	174.2	296	1.70	2.40	InSL	40	0.948	<0.001	3.2274	0.9991	127.0	318.0
					InM	12	0.906	<0.001	-2.7051	8.9250	8.3	188.0
					InTL	12	0.909	<0.001	2.5790	3.1811	73.0	223.0
<i>Priacanthus hamrur</i>	174.3	296	1.20	2.45	InSL	12	0.903	<0.001	2.3803	3.1497	60.0	178.0
					InM	24	0.916	<0.001	-0.8772	5.8796	1.0	184.0
					InTL	24	0.913	<0.001	3.2599	2.0840	35.0	225.0
<i>Epigonus cf. robustus*</i>	175.47	297	5.00	10.50	InFL	14	0.849	<0.001	3.3192	1.9957	66.0	215.0
					InSL	24	0.924	<0.001	3.0559	2.0991	29.0	180.0
					InM	52	0.917	<0.001	-3.0071	3.3735	7.7	165.6
<i>Neoscombrops annectens</i>	176.3	283	3.30	6.60	InTL	39	0.919	<0.001	3.3174	0.9108	124.0	237.0
					InFL	27	0.787	<0.001	3.6098	0.7251	137.0	212.0
					InSL	52	0.894	<0.001	3.0192	0.9501	84.0	190.0
<i>Synagrops japonicus</i>	176.5	283	3.40	6.90	InM	24	0.789	<0.001	-1.1622	2.8443	3.3	135.8
					InTL	23	0.829	<0.001	3.3802	0.9416	67.0	210.0
					InFL	24	0.843	<0.001	3.2794	0.9594	63.0	193.0
<i>Pomatomus saltatrix</i>	178.1	303	1.70	17.10	InSL	24	0.848	<0.001	3.0097	1.0285	53.0	170.0
					InM	43	0.979	<0.001	-5.7838	5.7597	4.4	218.1
					InTL	41	0.985	<0.001	1.9957	1.8428	71.0	252.0
<i>Pomadasys commersonnii</i>	179.10	320	3.53	18.80	InFL	42	0.983	<0.001	1.9488	1.8134	69.0	233.0
					InSL	44	0.983	<0.001	1.7854	1.8319	58.0	210.0
					InM	118	0.989	<0.001	-3.3162	3.9735	0.4	10800.0
<i>Pomadasys olivaceum</i>	179.17	320	2.05	10.65	InTL	117	0.985	<0.001	2.7714	1.3222	38.0	1080.0
					InFL	120	0.985	<0.001	2.6876	1.3138	36.0	958.0
					InSL	112	0.982	<0.001	2.5395	1.3281	31.0	880.0
<i>Pomadasys striatum</i>	179.18	320	4.50	9.00	InM	38	0.978	<0.001	-3.9346	3.9111	3.5	7570.0
					InTL	37	0.979	<0.001	2.3764	1.3705	68.0	932.0
					InFL	38	0.979	<0.001	2.3022	1.3638	63.0	861.0
<i>Dinoperca petersi</i>	180.1	284	7.20	17.60	InSL	40	0.978	<0.001	2.1062	1.3829	53.0	758.0
					InM	194	0.986	<0.001	-2.8269	3.3125	0.6	159.0
					InTL	104	0.994	<0.001	2.7676	1.1117	37.0	228.0
<i>Apion virescens</i>	181.3	316	7.06	10.10	InFL	194	0.992	<0.001	2.6940	1.1091	32.0	214.0
					InSL	104	0.993	<0.001	2.5428	1.1077	30.0	181.0
					InM	18	0.978	<0.001	-2.8563	3.4200	10.3	118.0
<i>Lutjanus kasmira</i>	181.11	316	5.30	10.80	InTL	18	0.966	<0.001	2.6431	1.1749	84.0	195.0
					InFL	18	0.961	<0.001	2.6204	1.1465	79.0	180.0
					InSL	17	0.973	<0.001	2.4886	1.1369	68.0	150.0
<i>Lutjanus russellii</i>	181.17	316	8.30	10.70	InM	15	0.948	<0.001	-3.9016	4.1195	75.4	1880.0
					InTL	26	0.949	<0.001	2.4297	1.3488	165.0	622.0
					InFL	8	0.926	<0.001	2.0863	1.4701	279.0	469.0
<i>Acanthopagrus berda</i>	183.1	322	6.08	13.40	InSL	27	0.948	<0.001	2.2406	1.3302	128.0	390.0
					InM	14	0.615	0.019	-0.5986	3.7440	451.1	4470.0
					InTL	13	0.684	0.010	2.9590	1.5984	351.0	816.0
<i>Argyrozona argyrozona</i>	183.5	322	4.60	20.80	InFL	15	0.719	0.003	2.0715	1.9461	300.0	935.0
					InSL	13	0.681	0.010	2.6606	1.6217	270.0	655.0
					InM	35	0.858	<0.001	-1.7770	3.1267	15.0	273.0
<i>Boopsoidea inornata</i>	183.6	322	1.71	11.30	InTL	35	0.860	<0.001	3.1792	1.0006	102.0	256.0
					InFL	36	0.865	<0.001	3.1000	1.0051	95.0	240.0
					InSL	35	0.870	<0.001	2.8713	1.0360	80.0	205.0
<i>Cheimerius nufar</i>	183.7	322	3.13	18.00	InM	29	0.811	<0.001	-1.3937	3.0047	152.8	381.1
					InTL	28	0.849	<0.001	2.6734	1.2305	200.0	282.0
					InFL	29	0.790	<0.001	3.0140	1.0545	188.0	270.0
<i>Chrysoblephus anglicus</i>	183.8	322	9.02	13.86	InSL	28	0.861	<0.001	2.2741	1.3007	155.0	227.0
					InM	29	0.924	<0.001	-2.6427	3.8630	76.7	2520.0
					InTL	29	0.953	<0.001	2.9485	1.2152	177.0	500.0
<i>Epigonus cf. robustus*</i>	175.47	297	5.00	10.50	InFL	29	0.949	<0.001	2.8224	1.2327	161.0	468.0
					InSL	29	0.949	<0.001	2.6494	1.2449	138.0	404.0
					InM	100	0.989	<0.001	-2.8595	3.4757	14.0	2020.0
<i>Pomatomus saltatrix</i>	178.1	303	1.70	17.10	InTL	109	0.991	<0.001	2.6267	1.2374	100.0	612.0
					InFL	111	0.990	<0.001	2.5393	1.2398	93.0	565.0
					InSL	110	0.990	<0.001	2.3076	1.2755	78.0	500.0
<i>Pomadasys olivaceum</i>	179.17	320	2.05	10.65	InM	36	0.993	<0.001	-2.6235	3.5332	0.6	387.0
					InTL	36	0.995	<0.001	2.8837	1.1495	36.0	292.0
					InFL	36	0.995	<0.001	2.8053	1.1340	33.0	259.0
<i>Pomadasys striatum</i>	179.18	320	4.50	9.00	InSL	36	0.994	<0.001	2.6233	1.1469	28.0	225.0
					InM	124	0.995	<0.001	-2.6715	3.7714	6.2	4100.0
					InTL	101	0.995	<0.001	2.7516	1.2848	76.0	613.0
<i>Pomatomus saltatrix</i>	178.1	303	1.70	17.10	InFL	159	0.995	<0.001	2.6789	1.2636	70.0	565.0
					InSL	102	0.995	<0.001	2.4918	1.2834	59.0	484.0
					InTL	22	0.849	<0.001	2.3476	1.5598	302.0	647.0
<i>Pomatomus saltatrix</i>	178.1	303	1.70	17.10	InFL	24	0.845	<0.001	2.0359	1.6208	251.0	543.0
					InSL	20	0.818	<0.001	2.2472	1.4828	215.0	480.0



Table 1 cont.

SPECIES	SSF No.	Nelson No.	OD (mm) MIN	OD (mm) MAX	Y axis	n	r	p	a	b	MIN (y) (mm/g)	MAX (y) (mm/g)
<i>Chrysoblephus cristiceps</i>	183.9	322	5.00	15.40	InM	21	0.985	<0.001	-2.4683	3.6111	25.4	1460.0
					InTL	22	0.988	<0.001	2.7867	1.2051	114.0	475.0
					InFL	23	0.988	<0.001	2.7742	1.1592	104.0	420.0
					InSL	21	0.987	<0.001	2.6026	1.1763	88.0	325.0
<i>Chrysoblephus gibbiceps</i>	183.10	322	8.06	16.72	InM	21	0.965	<0.001	-2.8673	4.1127	378.0	5400.0
					InTL	22	0.925	<0.001	3.0733	1.2208	257.0	674.0
					InFL	29	0.967	<0.001	2.2199	1.4872	203.0	580.0
					InSL	19	0.959	<0.001	2.0496	1.5130	200.0	517.0
<i>Chrysoblephus laticeps</i>	183.11	322	1.80	15.54	InM	18	0.989	<0.001	-2.1876	3.6243	0.6	1870.0
					InTL	18	0.990	<0.001	3.0819	1.1049	39.0	436.0
					InFL	20	0.988	<0.001	2.9689	1.1177	36.5	470.0
					InSL	18	0.989	<0.001	2.8384	1.1156	30.5	351.0
<i>Chrysoblephus puniceus</i>	183.13	322	6.90	14.90	InM	67	0.977	<0.001	-3.9863	4.3213	74.1	1900.0
					InTL	145	0.959	<0.001	2.0838	1.5674	163.0	554.0
					InFL	149	0.970	<0.001	2.0828	1.4905	140.0	447.0
					InSL	145	0.970	<0.001	1.9020	1.5137	121.0	396.0
<i>Cymatoceps nasutus</i>	183.15	322	3.50	21.00	InM	23	0.995	<0.001	-3.0386	4.4915	13.5	44500.0
					InTL	25	0.993	<0.001	2.6992	1.4427	92.0	1063.0
					InFL	29	0.993	<0.001	2.6217	1.4342	86.0	950.0
					InSL	26	0.992	<0.001	2.4771	1.4374	73.0	835.0
<i>Diplodus cervinus</i>	183.16	322	2.00	11.50	InM	38	0.990	<0.001	-3.1946	4.3210	1.0	2170.0
					InTL	47	0.990	<0.001	2.6749	1.3999	41.0	490.0
					InFL	47	0.990	<0.001	2.5582	1.3973	36.0	433.0
					InSL	47	0.989	<0.001	2.4006	1.4009	33.0	380.0
<i>Diplodus sargus</i>	183.17	322	1.20	9.50	InM	85	0.985	<0.001	-2.2919	3.9839	0.2	875.0
					InTL	86	0.988	<0.001	2.9528	1.3053	25.0	370.0
					InFL	87	0.987	<0.001	2.8631	1.2738	22.0	320.0
					InSL	86	0.989	<0.001	2.7027	1.2934	19.0	280.0
<i>Gymnocrotaphus curvidens</i>	183.18	322	2.30	10.62	InM	16	0.995	<0.001	-3.0158	4.2606	2.0	1400.0
					InTL	16	0.996	<0.001	2.7704	1.3158	50.0	379.0
					InFL	16	0.996	<0.001	2.7109	1.3063	47.0	349.0
					InSL	16	0.995	<0.001	2.5170	1.3342	40.0	305.0
<i>Lithognathus aureti</i>	183.19	322	9.14	13.44	InTL	20	0.752	<0.001	2.1736	1.6523	355.0	955.0
					InFL	21	0.749	<0.001	2.2109	1.6041	325.0	865.0
					InSL	21	0.752	<0.001	1.9708	1.6551	290.0	790.0
					InM	22	0.989	<0.001	-1.9568	3.7215	0.8	2250.0
<i>Lithognathus lithognathus</i>	183.20	322	1.53	14.00	InTL	23	0.983	<0.001	3.0517	1.2837	39.0	747.0
					InFL	25	0.982	<0.001	2.9568	1.2930	36.0	785.0
					InSL	22	0.989	<0.001	2.8598	1.2458	31.0	450.0
					InM	30	0.979	<0.001	-3.8196	4.5715	3.2	520.0
<i>Lithognathus mormyrus</i>	183.21	322	3.06	9.60	InTL	32	0.989	<0.001	2.5695	1.4520	63.0	316.0
					InFL	31	0.988	<0.001	2.5328	1.4106	59.0	277.0
					InSL	32	0.989	<0.001	2.3821	1.4136	50.0	244.0
					InM	30	0.977	<0.001	-3.7273	4.2177	26.9	1000.0
<i>Pachymetopon aeneum</i>	183.22	322	5.28	12.90	InTL	32	0.977	<0.001	2.2451	1.4972	120.0	430.0
					InFL	30	0.982	<0.001	2.0752	1.5209	106.0	390.0
					InSL	30	0.981	<0.001	1.8933	1.5425	93.0	340.0
					InTL	10	0.895	<0.001	3.1303	1.1747	285.0	496.0
<i>Pachymetopon grande</i>	183.24	322	9.00	14.32	InFL	26	0.825	<0.001	3.1947	1.0899	256.0	447.0
					InSL	9	0.908	<0.001	2.5937	1.2955	225.0	400.0
					InM	110	0.996	<0.001	-2.3066	3.2525	1.0	196.4
					InTL	111	0.996	<0.001	3.0488	1.0480	44.0	245.0
<i>Pagellus bellottii</i>	183.25	322	1.98	10.40	InFL	109	0.996	<0.001	3.0191	0.9974	42.0	216.0
					InSL	111	0.995	<0.001	2.8570	1.0178	36.0	188.0
					InM	30	0.984	<0.001	-2.6959	4.2555	3.3	40200.0
					InTL	32	0.982	<0.001	2.7241	1.4547	58.0	1367.0
<i>Petrus rupestris</i>	183.26	322	2.00	22.26	InFL	34	0.982	<0.001	2.6586	1.4440	55.0	1260.0
					InSL	31	0.979	<0.001	2.4803	1.4686	47.0	1160.0
					InM	30	0.975	<0.001	-3.1789	4.2366	126.0	4910.0
					InTL	33	0.983	<0.001	2.3307	1.5655	202.0	893.0
<i>Polysteganus praeorbitalis</i>	183.31	322	6.50	17.46	InFL	44	0.963	<0.001	2.3065	1.5269	181.0	785.0
					InSL	31	0.983	<0.001	1.9578	1.6255	156.0	720.0
					InM	31	0.960	<0.001	-5.3898	4.8594	200.0	9800.0
					InTL	40	0.962	<0.001	2.0412	1.5926	265.0	853.0
<i>Polysteganus undulosus</i>	183.32	322	8.70	21.00	InFL	66	0.972	<0.001	1.9453	1.5770	221.0	770.0
					InSL	31	0.955	<0.001	1.6266	1.6608	200.0	700.0
					InM	19	0.988	<0.001	-1.8062	3.7017	4.0	601.0
					InTL	31	0.982	<0.001	2.9002	1.2896	57.0	311.0
<i>Porcostoma dentata</i>	183.33	322	2.50	8.92	InFL	29	0.983	<0.001	2.8434	1.2806	54.0	290.0
					InSL	29	0.982	<0.001	2.6549	1.3013	45.0	252.0
					InM	85	0.988	<0.001	-2.8743	3.5378	1.1	760.0
					InTL	85	0.988	<0.001	-2.8743	3.5378	1.1	760.0

Table 1 cont.

SPECIES	SSF No.	Nelson No.	OD (mm) MIN	OD (mm) MAX	Y axis	n	r	p	a	b	MIN (y) (mm/g)	MAX (y) (mm/g)
<i>Rhabdosargus globiceps</i>	183.35	322	3.10	13.64	InTL	103	0.991	<0.001	2.7829	1.1478	46.0	400.0
					InFL	129	0.985	<0.001	2.6935	1.1456	42.0	347.0
					InSL	85	0.979	<0.001	2.5570	1.1362	39.0	270.0
					InM	28	0.987	<0.001	-2.2766	3.5786	4.6	1060.0
					InTL	31	0.988	<0.001	2.9802	1.1818	71.0	428.0
<i>Rhabdosargus holubi</i>	183.36	322	2.37	9.50	InFL	29	0.987	<0.001	2.9163	1.1642	67.0	378.0
					InSL	29	0.984	<0.001	2.7300	1.1845	57.0	340.0
					InM	79	0.973	<0.001	-2.1890	3.7008	3.1	376.6
					InTL	79	0.976	<0.001	3.0013	1.2097	58.0	298.0
					InFL	80	0.973	<0.001	2.9300	1.1760	54.0	277.0
<i>Rhabdosargus sarba</i>	183.37	322	6.18	14.40	InSL	79	0.974	<0.001	2.7547	1.1936	47.0	225.0
					InM	17	0.984	<0.001	-3.9207	4.5908	87.8	3635.0
					InTL	17	0.970	<0.001	2.5979	1.4319	186.0	571.0
					InFL	18	0.968	<0.001	2.3820	1.4742	160.0	590.0
					InSL	14	0.981	<0.001	2.1714	1.4924	134.0	432.0
<i>Sarpa salpa</i>	183.39	322	1.11	8.61	InM	78	0.989	<0.001	-2.4364	4.1081	0.3	921.0
					InTL	78	0.989	<0.001	3.0215	1.3002	31.0	398.0
					InFL	76	0.988	<0.001	2.9606	1.2661	29.0	352.0
					InSL	78	0.989	<0.001	2.7712	1.3195	25.0	320.0
					InM	34	0.981	<0.001	-4.0012	5.0275	0.7	16200.0
<i>Sparodon durbanensis</i>	183.40	322	2.00	15.10	InTL	42	0.991	<0.001	2.3968	1.6925	32.0	950.0
					InFL	41	0.991	<0.001	2.3062	1.6846	30.0	895.0
					InSL	41	0.991	<0.001	2.1244	1.7077	26.0	805.0
					InM	46	0.991	<0.001	-3.3160	4.0623	2.3	865.6
					InTL	45	0.993	<0.001	2.7207	1.2765	53.0	335.0
<i>Spondyliosoma emarginatum</i>	183.41	322	2.75	10.50	InFL	46	0.992	<0.001	2.6403	1.2673	48.0	318.0
					InSL	46	0.992	<0.001	2.4590	1.2862	40.0	278.0
					InM	40	0.953	<0.001	-2.5549	3.5276	32.0	430.8
					InTL	41	0.962	<0.001	2.6917	1.2561	132.0	333.0
					InFL	41	0.964	<0.001	2.5799	1.2669	120.0	299.0
<i>Spicara axillaris</i>	184.2	323	5.80	12.00	InSL	41	0.967	<0.001	2.3640	1.3016	101.0	262.0
					InM	26	0.904	<0.001	-1.6537	3.7295	94.1	770.0
					InTL	22	0.894	<0.001	3.1681	1.2090	175.0	350.0
					InFL	26	0.865	<0.001	3.0960	1.1845	154.0	310.0
					InSL	20	0.820	<0.001	3.1351	1.0992	136.0	271.0
<i>Gymnocranius griseus</i>	185.2	324	5.70	9.20	InM	32	0.937	<0.001	-1.6472	3.5940	77.1	664.7
					InTL	38	0.947	<0.001	3.2307	1.1844	180.0	360.0
					InFL	38	0.952	<0.001	3.1028	1.1887	162.0	320.0
					InSL	38	0.948	<0.001	2.8963	1.2295	143.0	283.0
					InM	21	0.955	<0.001	-2.3207	3.6431	79.1	412.8
<i>Lethrinus elongatus</i>	185.6	324	5.80	10.50	InTL	21	0.945	<0.001	2.9017	1.1979	165.0	280.0
					InFL	23	0.939	<0.001	2.8165	1.1932	148.0	260.0
					InSL	23	0.937	<0.001	2.5501	1.2510	125.0	230.0
					InM	16	0.902	<0.001	-4.5153	4.7318	160.0	5500.0
					InTL	19	0.927	<0.001	2.3614	1.5188	241.0	732.0
<i>Lethrinus mahsenoides</i>	185.12	324	6.10	9.80	InFL	20	0.928	<0.001	2.2034	1.5395	213.0	690.0
					InSL	17	0.920	<0.001	2.1613	1.4974	179.0	560.0
					InM	17	0.992	<0.001	-2.0615	3.5735	1.5	183.1
					InTL	17	0.992	<0.001	2.9500	1.1846	43.0	207.0
					InFL	17	0.993	<0.001	2.9443	1.1438	41.0	189.0
<i>Lethrinus nebulosus</i>	185.13	324	7.50	15.78	InSL	17	0.990	<0.001	2.6856	1.1790	33.0	156.0
					InM	14	0.978	<0.001	-1.2465	5.2359	6.8	849.8
					InTL	14	0.984	<0.001	3.3267	1.7115	79.0	400.0
					InFL	14	0.984	<0.001	3.1800	1.7298	71.0	354.0
					InSL	14	0.984	<0.001	3.0509	1.7535	63.0	320.0
<i>Monodactylus falciformis</i>	193.2	328	1.95	7.42	InM	15	0.982	<0.001	-4.0073	3.7854	7.5	78.6
					InFL	14	0.971	<0.001	2.6979	1.2035	99.0	207.0
					InM	138	0.992	<0.001	-4.2899	4.0761	0.4	48000.0
					InTL	153	0.994	<0.001	2.3958	1.3764	32.0	1701.0
					InSL	99	0.994	<0.001	2.1726	1.3932	25.0	1370.0
<i>Parupeneus rubescens</i>	199.1	326	1.90	37.50	InM	39	0.985	<0.001	-5.1699	4.2866	47.0	3300.0
					InTL	55	0.988	<0.001	1.8866	1.5083	165.0	682.0
					InSL	45	0.979	<0.001	1.4951	1.5922	125.0	582.0
					InM	37	0.991	<0.001	-4.4887	4.2412	1.9	5450.0
					InTL	38	0.989	<0.001	2.2440	1.4816	58.0	1060.0
<i>Argyrosomus holalepidotus*</i>	199.2	326	8.40	21.20	InFL	78	0.990	<0.001	2.0513	1.5511	140.0	998.0
					InSL	33	0.989	<0.001	2.0193	1.5034	49.0	900.0
					InM	30	0.900	<0.001	-2.9180	3.3387	320.0	940.0
					InTL	30	0.926	<0.001	3.0596	1.0302	310.0	428.0
					InM	33	0.985	<0.001	-4.7637	4.1342	3.8	161.0
<i>Argyrosomus thorpei</i>	199.3	326	3.20	23.60	InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
					InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
					InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
					InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
					InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
<i>Atractoscion aequidens</i>	199.3	326	3.20	23.60	InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
					InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
					InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
					InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
					InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
<i>Atractoscion aequidens</i>	199.3	326	3.20	23.60	InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
					InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
					InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
					InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
					InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
<i>Atractoscion aequidens</i>	199.3	326	3.20	23.60	InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
					InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
					InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
					InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
					InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
<i>Atractoscion aequidens</i>	199.3	326	3.20	23.60	InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
					InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
					InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
					InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
					InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
<i>Atractoscion aequidens</i>	199.3	326	3.20	23.60	InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
					InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
					InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
					InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
					InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
<i>Atractoscion aequidens</i>	199.3	326	3.20	23.60	InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
					InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
					InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
					InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
					InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
<i>Atractoscion aequidens</i>	199.3	326	3.20	23.60	InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
					InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
					InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
					InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
					InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
<i>Atractoscion aequidens</i>	199.3	326	3.20	23.60	InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
					InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
					InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
					InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
					InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
<i>Atractoscion aequidens</i>	199.3	326	3.20	23.60	InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
					InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
					InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
					InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
					InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
<i>Atractoscion aequidens</i>	199.3	326	3.20	23.60	InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
					InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
					InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
					InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
					InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
<i>Atractoscion aequidens</i>	199.3	326	3.20	23.60	InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
					InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
					InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
					InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
					InTL	31	0.987	<0.001	2.5136	1.1968	74.0	210.0
<i>Atractoscion aequidens</i>	199.3	326	3.20	23.60	InTL	31	0.98					



Table 1 cont.

SPECIES	SSF No.	Nelson No.	OD (mm) MIN	OD (mm) MAX	Y axis	n	r	p	a	b	MIN (y) (mm/g)	MAX (y) (mm/g)
<i>Otolithes ruber</i>	199.7	326	4.50	15.90	InSL	32	0.990	<0.001	2.2116	1.2394	59.0	178.0
					InM	47	0.993	<0.001	-4.5083	4.0677	5.2	915.0
					InTL	61	0.993	<0.001	2.3777	1.3346	82.0	435.0
<i>Umbrina canariensis</i>	199.8	326	2.91	20.40	InSL	61	0.993	<0.001	2.0227	1.4112	65.0	370.0
					InM	191	0.989	<0.001	-3.3477	3.7972	1.7	7900.0
					InTL	188	0.986	<0.001	2.7120	1.2217	53.0	836.0
<i>Secutor insidiator</i>	201.4	311	1.00	4.10	InSL	193	0.989	<0.001	2.3387	1.2918	49.0	695.0
					InM	19	0.991	<0.001	-1.2441	3.1939	0.3	34.0
					InTL	20	0.993	<0.001	3.4116	0.9697	32.0	125.0
<i>Chaetodon blackburnii</i>	205.3	338	1.60	4.60	InFL	20	0.992	<0.001	3.3460	0.9262	30.0	112.0
					InSL	20	0.992	<0.001	3.2390	0.9102	27.0	100.0
					InM	15	0.974	<0.001	-0.5043	2.8096	2.4	43.6
<i>Chaetodon madagaskariensis</i>	205.10	338	3.05	4.00	InTL	13	0.983	<0.001	3.3330	0.9832	45.0	122.0
					InSL	13	0.983	<0.001	3.1030	1.0189	36.0	100.0
					InM	13	0.779	0.002	0.4899	2.1904	18.6	33.5
<i>Brama brama</i>	207.1	312	3.50	6.40	InTL	14	0.779	0.001	3.8286	0.6396	91.0	110.0
					InSL	14	0.903	<0.001	3.4918	0.7719	75.0	92.0
					InM	43	0.772	<0.001	3.5947	2.1934	60.0	2290.0
<i>Emmelichthys nitidus nitidus</i>	209.1	315	2.05	10.80	InTL	43	0.787	<0.001	5.2987	0.5586	351.0	567.0
					InFL	43	0.786	<0.001	4.8472	0.7262	255.0	478.0
					InSL	41	0.813	<0.001	4.5684	0.8293	225.0	432.0
<i>Plagiogeneion rubiginosus</i>	209.3	315	3.90	12.20	InM	42	0.983	<0.001	-2.4456	3.8311	2.3	710.0
					InTL	40	0.983	<0.001	3.2242	1.2005	70.0	419.0
					InFL	41	0.944	<0.001	3.0719	1.2179	62.0	372.0
<i>Lichia amia</i>	210.33	306	0.82	12.08	InSL	42	0.982	<0.001	2.9903	1.2366	57.0	344.0
					InM	42	0.989	<0.001	-1.8523	3.3924	16.6	740.8
					InTL	41	0.988	<0.001	3.2357	1.0987	116.0	405.0
<i>Seriola lalandi</i>	210.44	306	4.20	9.30	InFL	42	0.983	<0.001	3.1559	1.0710	104.0	360.0
					InSL	42	0.985	<0.001	3.0353	1.0847	95.0	330.0
					InM	32	0.993	<0.001	0.8917	3.5223	1.6	9200.0
<i>Trachinotus africanus</i>	210.47	306	2.25	11.90	InTL	27	0.995	<0.001	4.1860	1.1862	55.0	1200.0
					InFL	34	0.994	<0.001	4.0675	1.1618	50.0	930.0
					InSL	26	0.994	<0.001	3.9830	1.1415	44.0	770.0
<i>Trachurus delagoa</i>	210.51	306	1.69	6.10	InM	18	0.936	<0.001	-0.3080	4.5509	570.0	19500.0
					InTL	20	0.937	<0.001	3.7730	1.5305	397.0	1368.0
					InFL	27	0.917	<0.001	3.5386	1.5884	351.0	1245.0
<i>Trachurus trachurus</i>	210.52	306	0.80	12.60	InSL	18	0.952	<0.001	3.4527	1.5919	314.0	1130.0
					InM	19	0.939	<0.001	-0.0839	3.5204	14.4	9950.0
					InTL	26	0.943	<0.001	3.4006	1.4333	91.0	990.0
<i>Cheilodactylus fasciatus</i>	215.1	351	1.65	6.50	InFL	26	0.942	<0.001	3.2566	1.4124	76.0	840.0
					InSL	26	0.942	<0.001	3.1169	1.4378	70.0	783.0
					InM	21	0.935	<0.001	-1.3398	3.1750	1.2	78.1
<i>Cheilodactylus pixi</i>	215.2	351	1.52	4.80	InTL	21	0.943	<0.001	3.4473	1.0037	52.0	188.0
					InFL	21	0.949	<0.001	3.3531	0.9969	47.0	167.0
					InSL	21	0.946	<0.001	3.2154	1.0229	41.0	151.0
<i>Chirodactylus brachydactylus</i>	215.3	351	1.11	6.86	InM	223	0.991	<0.001	-1.5889	3.1973	0.1	910.0
					InTL	220	0.992	<0.001	3.3550	1.0627	25.0	485.0
					InFL	200	0.991	<0.001	3.2355	1.0729	38.0	435.0
<i>Chirodactylus grandis</i>	215.4	351	1.00	9.10	InSL	217	0.992	<0.001	3.1560	1.0692	19.0	403.0
					InM	43	0.981	<0.001	-0.8490	3.8105	4.3	423.1
					InTL	48	0.980	<0.001	3.4900	1.2409	74.0	325.0
<i>Oreochromis mossambicus</i>	218.1	344	2.20	7.26	InFL	48	0.980	<0.001	3.3867	1.2518	64.0	293.0
					InSL	48	0.979	<0.001	3.2653	1.2496	59.0	256.0
					InM	62	0.958	<0.001	-0.8024	3.7640	1.9	111.6
<i>Chromis dimidiata</i>	219.14	346	1.60	3.60	InTL	61	0.964	<0.001	3.4949	1.1881	52.0	189.0
					InFL	60	0.965	<0.001	3.4167	1.1785	48.0	175.0
					InSL	62	0.964	<0.001	3.2627	1.2004	41.0	154.0
<i>Oreochromis mossambicus</i>	218.1	344	2.20	7.26	InM	40	0.978	<0.001	-0.8681	3.9806	1.3	1210.0
					InTL	50	0.985	<0.001	3.3956	1.3633	44.0	445.0
					InFL	50	0.984	<0.001	3.3228	1.3387	39.0	392.0
<i>Chromis dimidiata</i>	219.14	346	1.60	3.60	InSL	50	0.983	<0.001	3.1709	1.3577	35.0	356.0
					InM	31	0.990	<0.001	-1.1818	4.3681	0.6	8500.0
					InTL	31	0.991	<0.001	3.3759	1.4382	36.0	870.0
<i>Oreochromis mossambicus</i>	218.1	344	2.20	7.26	InFL	31	0.991	<0.001	3.3025	1.4260	33.0	760.0
					InSL	31	0.989	<0.001	3.1685	1.4352	29.0	690.0
					InM	15	0.996	<0.001	-2.6777	4.0652	1.8	258.0
<i>Chromis dimidiata</i>	219.14	346	1.60	3.60	InTL	15	0.996	<0.001	2.9087	1.2679	52.0	233.0
					InSL	15	0.995	<0.001	2.6008	1.2940	39.0	182.0
					InM	15	0.963	<0.001	-2.6248	3.8032	0.4	7.8
<i>Chromis dimidiata</i>	219.14	346	1.60	3.60	InTL	22	0.920	<0.001	2.9841	1.1722	30.0	89.0
					InFL	22	0.962	<0.001	2.6949	1.1880	24.0	66.0

Table 1 cont.

SPECIES	SSF No.	Nelson No.	OD (mm) MIN	OD (mm) MAX	Y axis	n	r	p	a	b	MIN (y) (mm/g)	MAX (y) (mm/g)
<i>Stethojulis interrupta</i>	220.56	358	0.75	1.80	InSL	22	0.962	<0.001	2.4709	1.2161	19.0	55.0
					InM	19	0.819	<0.001	0.5643	2.8607	0.6	12.5
					InTL	19	0.818	<0.001	3.9809	0.9256	36.0	100.0
<i>Liza dumerilii</i>	222.3	355	4.10	9.49	InSL	19	0.822	<0.001	3.7953	0.9282	30.0	82.0
					InM	28	0.990	<0.001	-4.0450	4.5787	10.9	394.0
					InTL	26	0.990	<0.001	2.6806	1.4525	132.0	349.0
<i>Liza richardsonii</i>	222.7	355	3.00	10.50	InFL	28	0.990	<0.001	2.6087	1.4411	102.0	317.0
					InSL	28	0.989	<0.001	2.4115	1.4664	87.0	275.0
					InM	63	0.980	<0.001	-2.7832	3.9285	5.6	725.0
<i>Liza tricuspidens</i>	222.8	355	3.29	12.00	InTL	63	0.986	<0.001	2.8651	1.3398	79.0	392.0
					InFL	61	0.987	<0.001	2.7959	1.3227	73.0	353.0
					InSL	63	0.986	<0.001	2.6397	1.3355	62.0	310.0
<i>Mugil cephalus</i>	222.10	355	1.69	13.00	InM	39	0.985	<0.001	-2.7780	4.1431	11.0	2009.0
					InTL	40	0.988	<0.001	2.9047	1.4008	106.0	600.0
					InFL	40	0.988	<0.001	2.8748	1.3643	98.0	537.0
<i>Myxus capensis</i>	222.11	355	5.82	12.25	InSL	40	0.989	<0.001	2.6807	1.3922	84.0	475.0
					InM	28	0.988	<0.001	-2.2450	3.8509	1.0	4460.0
					InTL	36	0.990	<0.001	3.0095	1.3508	45.0	736.0
<i>Sphyraena acutipinnis</i>	224.1	356	2.20	10.60	InFL	36	0.989	<0.001	2.9577	1.3165	43.0	651.0
					InSL	30	0.993	<0.001	2.8420	1.2733	37.0	576.0
					InM	16	0.978	<0.001	-4.4324	4.7440	58.0	621.0
<i>Halidesmus scapularis</i>	227.1	376	0.90	2.10	InTL	17	0.972	<0.001	2.7181	1.4148	187.0	482.0
					InFL	17	0.974	<0.001	2.6311	1.4062	169.0	433.0
					InSL	16	0.968	<0.001	2.3138	1.4982	146.0	327.0
<i>Champsodon capensis</i>	229.1	378	1.00	3.30	InM	74	0.991	<0.001	-2.6027	3.2193	1.0	200.4
					InTL	73	0.996	<0.001	3.1980	1.0836	58.0	325.0
					InFL	63	0.993	<0.001	3.0792	1.1003	54.0	302.0
<i>Uranoscopus archionema</i>	230.2	383	7.00	11.94	InSL	73	0.996	<0.001	3.0586	1.0706	31.0	280.0
					InM	93	0.875	<0.001	-0.2321	3.2732	0.4	8.0
					InTL	93	0.883	<0.001	4.2174	1.3009	47.0	167.0
<i>Cremnochorites capensis</i>	236.1	390	1.20	2.90	InSL	93	0.875	<0.001	4.1414	1.2812	44.0	166.0
					InM	92	0.956	<0.001	-0.9515	4.0478	0.3	20.4
					InTL	92	0.969	<0.001	3.5711	1.3906	35.0	146.0
<i>Blennioclinus brachycephalus</i>	237.1	393	0.60	1.60	InFL	51	0.894	<0.001	3.8519	0.9374	58.0	134.0
					InSL	94	0.968	<0.001	3.3938	1.3805	29.0	119.0
					InM	17	0.860	<0.001	-3.6907	3.8999	49.8	561.6
<i>Cirrhibarbis capensis</i>	237.7	393	0.70	3.60	InTL	17	0.863	<0.001	2.5499	1.2294	146.0	300.0
					InSL	17	0.865	<0.001	2.2804	1.2456	115.0	240.0
					InM	38	0.942	<0.001	-2.1858	3.5954	0.3	5.4
<i>Climacoporus navalis</i>	237.8	393	0.80	1.60	InTL	38	0.951	<0.001	3.0261	1.1776	28.0	74.0
					InSL	38	0.955	<0.001	2.7982	1.2135	22.0	61.0
					InM	43	0.906	<0.001	1.2401	2.6583	0.7	18.6
<i>Clinus cottoides</i>	237.14	393	0.80	2.40	InTL	43	0.923	<0.001	4.2399	0.8527	39.0	105.0
					InSL	43	0.931	<0.001	4.0903	0.8740	32.0	92.0
					InM	81	0.944	<0.001	-0.5675	3.8701	0.2	158.0
<i>Clinus superciliosus</i>	237.22	393	0.90	3.50	InTL	82	0.950	<0.001	3.7371	1.2285	30.0	240.0
					InSL	82	0.951	<0.001	3.6097	1.2331	26.0	210.0
					InM	34	0.882	<0.001	-0.3632	2.3960	0.3	2.5
<i>Clinus taurus</i>	237.23	393	1.20	3.30	InTL	34	0.887	<0.001	3.7795	0.7673	32.0	63.0
					InSL	34	0.883	<0.001	3.6492	0.7871	28.0	57.0
					InM	95	0.968	<0.001	-0.4853	3.6441	0.4	21.6
<i>Pavoclinus graminis</i>	237.28	393	0.60	1.70	InTL	95	0.968	<0.001	3.6792	1.1705	32.0	134.0
					InSL	92	0.968	<0.001	3.5307	1.1783	27.0	117.0
					InM	93	0.972	<0.001	-0.0025	3.6710	0.5	90.4
<i>Pavoclinus pavo</i>	237.34	393	0.65	1.20	InTL	95	0.939	<0.001	3.8448	1.1455	36.0	190.0
					InSL	94	0.970	<0.001	3.6459	1.1883	30.0	163.0
					InM	16	0.980	<0.001	-0.1974	3.3735	2.1	61.5
<i>Paracallionymus costatus</i>	239.6	399	1.30	3.20	InTL	16	0.968	<0.001	3.7091	1.0612	55.0	156.0
					InSL	16	0.973	<0.001	3.5279	1.0885	46.0	134.0
					InM	19	0.861	<0.001	0.6717	2.3682	3.1	11.1
					InTL	19	0.881	<0.001	4.0683	0.6896	68.0	96.0
					InSL	19	0.695	<0.001	3.9678	0.5485	58.0	82.0
					InM	46	0.925	<0.001	1.5359	3.3163	0.4	23.5
					InTL	46	0.929	<0.001	4.3322	1.0429	37.0	129.0
					InSL	46	0.929	<0.001	4.1737	1.0647	31.0	111.0
					InM	25	0.586	0.002	0.9280	2.1964	0.8	6.2
					InTL	25	0.593	0.002	4.1890	0.6920	44.0	89.0
					InSL	25	0.614	0.001	4.0246	0.7096	37.0	74.0
					InM	56	0.950	<0.001	-2.1618	4.6386	0.4	30.8
					InTL	33	0.937	<0.001	3.1829	1.7661	40.0	176.0
					InSL	55	0.950	<0.001	3.0171	1.6019	32.0	150.0



Table 1 cont.

SPECIES	SSF No.	Nelson No.	OD (mm) MIN	OD (mm) MAX	Y axis	n	r	p	a	b	MIN (y) (mm/g)	MAX (y) (mm/g)
<i>Caffrogobius nudiceps</i>	240.23	403	1.45	3.85	InM	15	0.978	<0.001	-2.3131	4.2793	0.5	16.0
					InTL	16	0.970	<0.001	3.1174	1.2937	36.0	113.0
					InSL	16	0.970	<0.001	2.9704	1.2339	30.0	89.0
<i>Caffrogobius saldanha</i>	240.24	403	2.10	3.60	InM	16	0.816	<0.001	-1.8877	3.1093	1.6	8.6
					InTL	16	0.803	<0.001	3.2424	0.9350	53.0	89.0
					InSL	16	0.802	<0.001	3.0095	0.9599	43.0	73.0
<i>Sufflogobius bibarbatus</i>	240.97	403	1.90	4.40	InM	66	0.932	<0.001	-1.1459	3.3309	3.2	39.2
					InTL	66	0.941	<0.001	3.5201	1.0564	72.0	159.0
					InSL	68	0.941	<0.001	3.3355	1.0302	60.0	125.0
<i>Neopinnula orientalis</i>	247.4	412	4.30	7.10	InM	30	0.930	<0.001	-4.7986	4.8995	13.5	133.1
					InTL	28	0.965	<0.001	2.7553	1.3923	127.0	245.0
					InFL	30	0.951	<0.001	2.6113	1.4237	117.0	226.0
<i>Thyrsites atun</i>	247.8	412	1.60	14.28	InSL	30	0.952	<0.001	2.4472	1.4651	106.0	210.0
					InM	61	0.994	<0.001	-1.7389	3.9189	1.4	5040.0
					InTL	53	0.980	<0.001	3.9602	1.1198	103.0	1070.0
<i>Lepidopus caudatus</i>	248.4	413	1.50	8.50	InFL	41	0.983	<0.001	3.2164	1.4178	140.0	1000.0
					InSL	42	0.974	<0.001	3.9209	1.0753	97.0	950.0
					InM	130	0.993	<0.001	-1.9230	4.5316	0.9	1880.0
<i>Trichiurus lepturus</i>	248.6	413	2.10	8.20	InTL	113	0.985	<0.001	4.2069	1.4239	120.0	2630.0
					InFL	98	0.985	<0.001	4.2941	1.3561	124.0	2330.0
					InSL	115	0.990	<0.001	4.1747	1.4071	115.0	2090.0
<i>Scomber japonicus</i>	249.11	414	1.00	7.50	InM	51	0.922	<0.001	-1.3846	3.9336	3.7	370.0
					InTL	49	0.952	<0.001	4.2215	1.4143	191.0	835.0
					InSL	26	0.749	<0.001	0.0062	3.6358	132.0	804.0
<i>Schedophilus huttoni</i>	254.6	423	15.74	20.38	InM	163	0.979	<0.001	-0.7220	4.0055	1.4	2600.0
					InTL	151	0.986	<0.001	3.7840	1.2379	58.0	610.0
					InFL	164	0.984	<0.001	3.7088	1.2334	53.0	560.0
<i>Stromateus fiatola</i>	254.10	423	2.60	8.01	InSL	164	0.984	<0.001	3.6437	1.2317	51.0	520.0
					InM	18	0.630	0.005	-2.0206	3.3702	960.0	3570.0
					InTL	18	0.753	<0.001	2.7849	1.3159	551.0	840.0
<i>Ariomma indica</i>	255.1	420	1.05	4.90	InFL	18	0.731	<0.001	2.6356	1.3458	521.0	797.0
					InSL	18	0.754	<0.001	2.2242	1.4510	457.0	730.0
					InM	53	0.979	<0.001	-1.3839	3.5562	7.3	718.9
<i>Cubiceps caeruleus</i>	255.4	420	4.60	7.30	InTL	53	0.984	<0.001	3.1827	1.2418	77.0	335.0
					InFL	53	0.908	<0.001	3.2040	1.1276	72.0	294.0
					InSL	53	0.980	<0.001	2.9697	1.1821	60.0	260.0
<i>Psenes whiteleggii</i>	255.12	420	5.44	7.22	InM	18	0.987	<0.001	-0.8146	3.1036	0.4	71.7
					InTL	18	0.991	<0.001	3.3345	1.0924	29.0	162.0
					InFL	18	0.991	<0.001	3.2474	1.0380	25.0	135.0
<i>Citharoides macrolepis</i>	258.1	433	5.00	7.40	InSL	18	0.987	<0.001	3.0635	1.0836	20.0	116.0
					InM	34	0.939	<0.001	-1.8518	3.5609	38.4	216.3
					InTL	31	0.958	<0.001	3.2547	1.1793	163.0	275.0
<i>Amoglossus capensis</i>	259.1	434	1.80	3.20	InFL	34	0.962	<0.001	3.1426	1.1713	145.0	240.0
					InSL	34	0.966	<0.001	2.9482	1.2312	130.0	220.0
					InM	20	0.957	<0.001	-3.0746	3.8248	31.4	92.0
<i>Cynoglossus capensis</i>	261.3	436	1.52	5.05	InTL	20	0.942	<0.001	2.8812	1.1940	133.0	188.0
					InFL	20	0.931	<0.001	2.6644	1.2365	116.0	165.0
					InSL	20	0.930	<0.001	2.4220	1.3025	104.0	147.0
<i>Cynoglossus zanzibarensis</i>	261.9	436	1.42	7.10	InM	14	0.934	<0.001	-2.3015	3.5540	28.9	123.3
					InTL	14	0.944	<0.001	3.2581	1.1045	154.0	243.0
					InSL	14	0.941	<0.001	2.9955	1.1530	128.0	203.0
<i>Austroglossus microlepis</i>	262.2	437	2.15	5.00	InM	44	0.920	<0.001	-0.5850	3.8753	4.7	44.7
					InTL	42	0.985	<0.001	3.7598	1.2361	84.0	172.0
					InSL	44	0.941	<0.001	3.5203	1.2741	69.0	144.0
<i>Austroglossus pectoralis</i>	262.3	437	2.09	6.10	InM	103	0.982	<0.001	-2.1634	4.1337	0.8	101.0
					InTL	103	0.985	<0.001	3.3518	1.3272	47.0	241.0
					InSL	59	0.982	<0.001	3.1681	1.3718	56.0	206.0
<i>Solea bleekeri</i>	262.12	437	1.60	2.65	InM	127	0.896	<0.001	-0.8904	3.5417	0.8	417.7
					InTL	125	0.932	<0.001	3.6784	1.2226	50.0	397.0
					InSL	124	0.921	<0.001	3.5951	1.2297	43.0	372.0
<i>Solea bleekeri</i>	262.12	437	1.60	2.65	InM	34	0.966	<0.001	-0.0803	3.7411	17.6	400.0
					InTL	34	0.969	<0.001	4.1534	1.1042	145.0	365.0
					InSL	34	0.971	<0.001	4.0273	1.1151	132.0	328.0
<i>Solea bleekeri</i>	262.12	437	1.60	2.65	InM	48	0.973	<0.001	-0.5547	3.7281	8.2	518.0
					InTL	48	0.977	<0.001	3.9708	1.1571	120.0	412.0
					InSL	42	0.977	<0.001	3.8345	1.1681	108.0	307.0
<i>Solea bleekeri</i>	262.12	437	1.60	2.65	InM	17	0.839	<0.001	0.1224	3.6291	5.3	34.2
					InTL	17	0.853	<0.001	3.9247	1.0034	78.0	128.0
					InSL	11	0.815	0.002	3.9449	0.7760	80.0	110.0

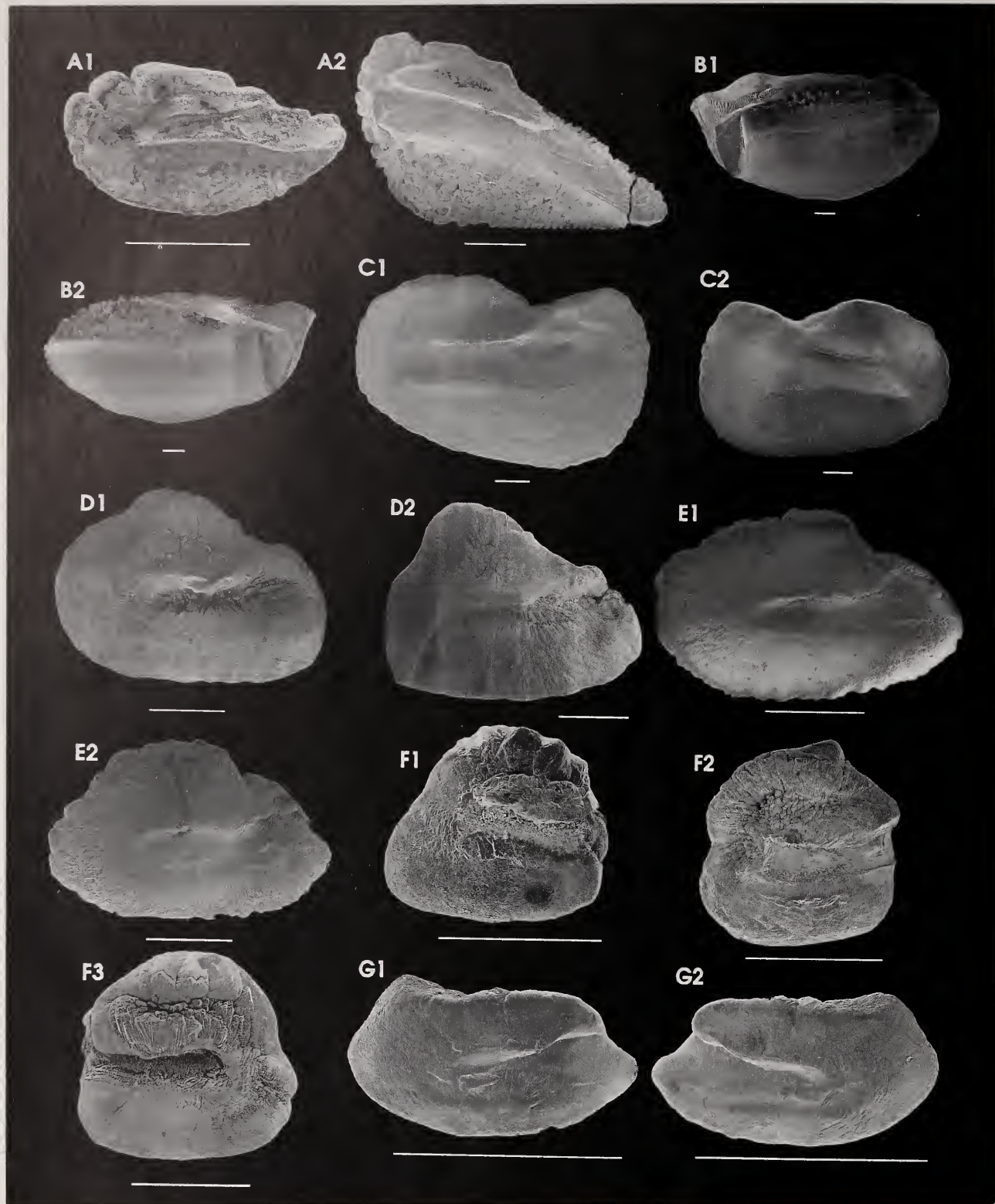


Plate 1. ELOPIDAE 43. A. *Elops machnata* SSF 36.2. A1. PEM 5836 - L. 2.7 mm OD, 86 mm TL. A2. PEM 14825 - L. 11.1 mm OD, 588 mm TL. ALBULIDAE 45. B. *Albula vulpes* SSF 38.1. B1. PEM 6120 - L. 13.3 mm OD. B2. PEM 6111 - R. 15 mm OD. C. *Pterothrissus bellocci* SSF 38.2. C1. PEM 1014 - L. 9.4 mm OD, 305 mm TL. C2. PEM 1014 - R. 9.44 mm OD, 300 mm TL. HALOSAURIDAE 46. D. *Halosauropsis macrochir* SSF 53.3. D1. PEM 0952 - L. 3.9 mm OD, 77 mm HL. D2. PEM 0952 - L. 3.9 mm OD, 86 mm HL. E. *Halosaurus ovenii* SSF 53.4. E1. PEM 14612 - L. 3.3 mm OD, 379 mm TL. E2. PEM 12422 - L. 3.5 mm OD, 435 mm TL. NOTACANTIIDAE 47. F. *Notacanthus sexspinis* SSF 52.1. F1. PEM 14904 (RUSI 35581) - L. 1.5 mm OD, 327 mm TL. F2. PEM 9065 - L. 1.6 mm OD, 395 mm TL. F3. PEM 14903 (RUSI 35566) - R. 1.7 mm OD, 365 mm TL. XENOCONGRIDAE 52. G. *Kaupichthys* sp. SSF 43.—. G1. PEM 15624 - R. 1.35 mm OD, 121 mm TL. G2. PEM 15624 - L. Scale bars 1 mm (—).



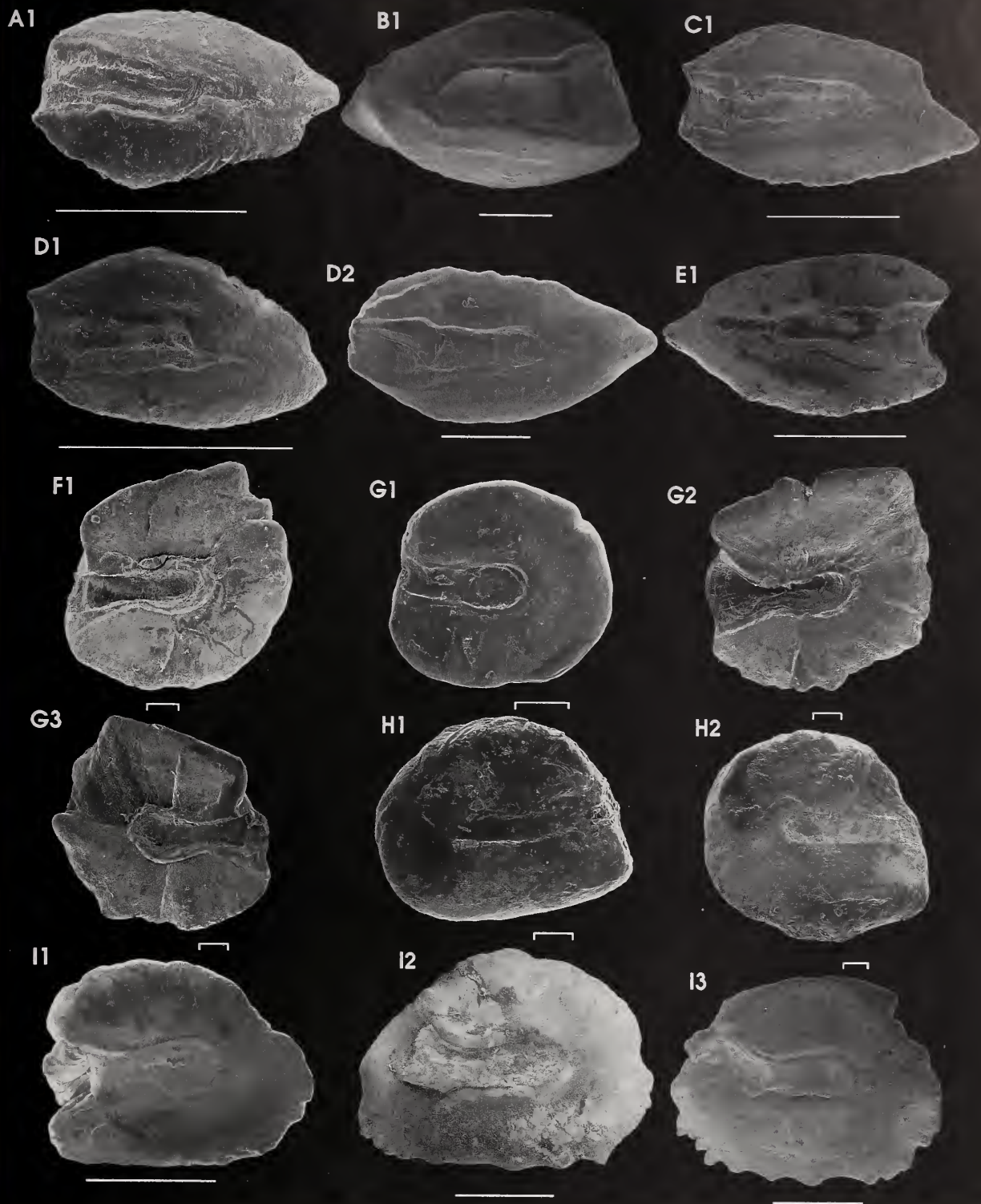


Plate 2. MURAENIDAE 54. A. *Gymnothorax eurostus* SSF 41.10. A1. PEM 2853 - L. 1.75 mm OD, 193 mm TL. B. *G. flavimarginatus* SSF 41.12. B1. PEM 14226 - L. 4.2 mm OD, 730 mm TL. C. *G. rueppelliae* SSF 41.23. C1. PEM 14543 (RUSI 31414) - R. 2.5 mm OD, 407 mm TL. D. *G. undulatus* SSF 41.24. D1. PEM 14260 - R. 1.1 mm OD, 139 mm TL. D2. PEM 14229 - R. 3.6 mm OD, 420 mm TL. E. *Uropterygius micropterus* SSF 41.31. E1. 0636H - L. 2.3 mm OD, 310 mm TL. NEMICHTHYIDAE 55. F. *Avocettina acuticeps* SSF 51.1. F1. PEM 0941 - R. 0.85 mm OD, c. 500 mm TL. G. *Nemichthys curvirostris* SSF 51.3. G1. 1606H - R. 0.45 mm OD. G2. PEM 0963 - R. 0.55 mm OD, 1020 mm TL. G3. PEM 0963 - L. H. *N. scolopaceus* SSF 51.4. H1. PEM 13451 - L. 0.8 mm OD, 388 mm TL. H2. PEM 13446 - L. 1.2 mm OD, 725 mm TL. SYNAPHIOBRANCHIIDAE 57. I. *Diastobranchus capensis* SSF 46.1. I1. PEM 13868 - R. 2.2 mm OD, 485 mm TL. I2. PEM 14488 (RUSI 31463) - R. 3.3 mm OD, 651 mm TL. I3. PEM 13695 (RUSI 28280) - R. 3.4 mm OD, 760 mm TL. Scale bars 1 mm (—) or 0.1 mm (—).

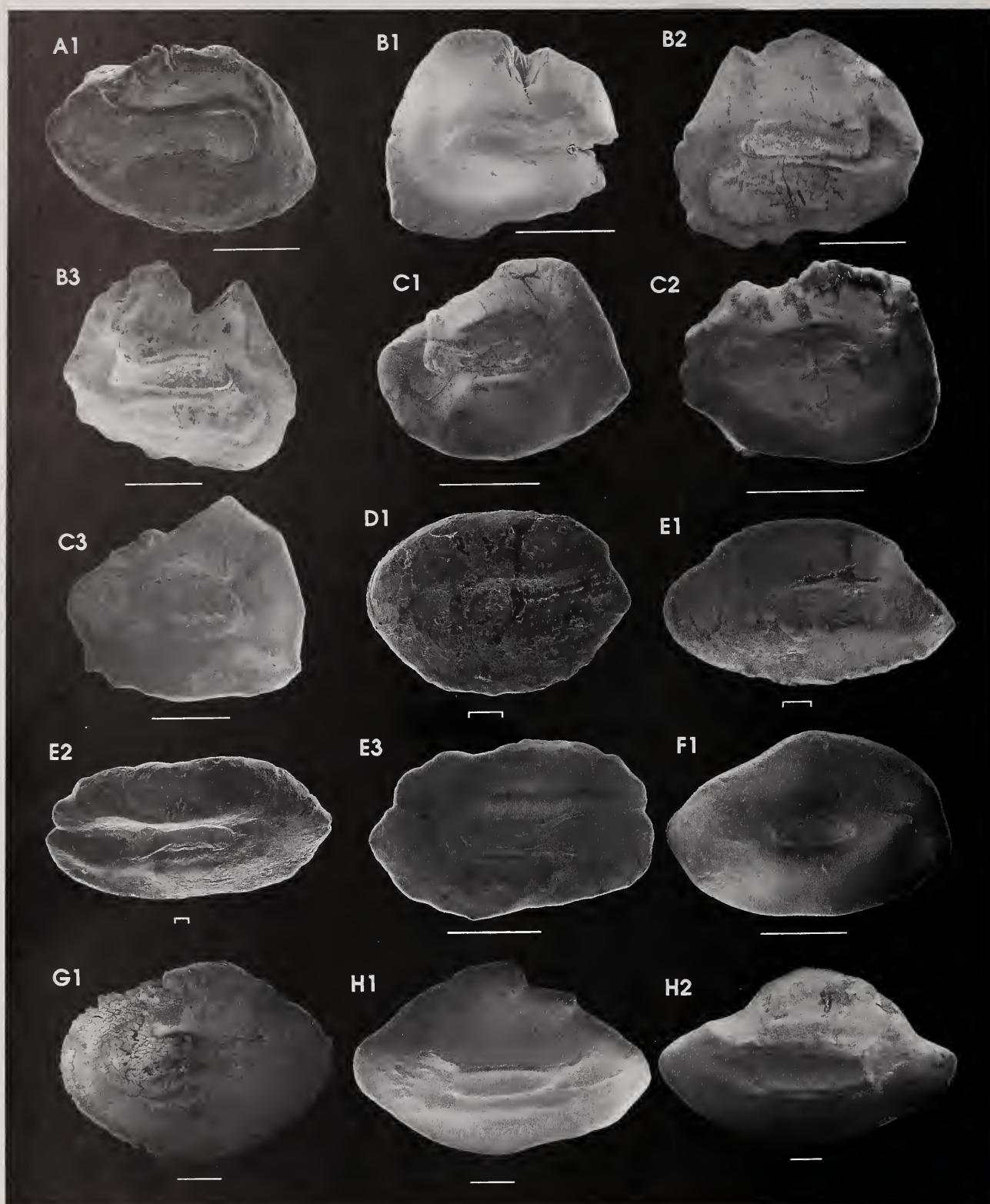


Plate 3. SYNAPIHOBRANCHIIDAE 57 ctd. A. *Dysomma anguillare* SSF 46.2. A1. PEM 0226 - R. 3.45 mm OD, 400 mm TL. B. *Synaphobranchus affinis* SSF 46.6. B1. PEM 14947 (RUSI 35604) - L. 2.6 mm OD, 445 mm TL. B2. PEM 14946 (RUSI 35604) - L. 3.2 mm OD, 489 mm TL. B3. PEM 14946 - R. C. *S. kaupii* SSF 46.7. C1. PEM 13693 (RUSI 28277) - R. 2.4 mm OD, 455 mm TL. C2. PEM 14003 - R. 2.6 mm OD, 498 mm TL. C3. PEM 13694 (RUSI 28278) - R. 3.3 mm OD, 508 mm TL. OPHICHTHIDAE 58. D. *Muraenichthys gymnotus* SSF 42.10. D1. PEM 10426 - L. 1.0 mm OD, 237 mm TL. E. *Ophisurus serpens* SSF 42.23. E1. PEM 2146 - L. 1.05 mm OD, 253 mm TL. E2. PEM 12820 (RUSI 28276) - R. 2.4 mm OD, 695 mm TL. E3. PEM 0302 - L. 3.1 mm OD, 585 mm TL. NETTASTOMATIDAE 59. F. *Nettastoma parviceps* SSF 47.1. F1. PEM 14912 (RUSI 35567) - 3.5 mm OD, 490 mm TL. CONGRIDAE 62. G. *Ariosoma mauritianum* SSF 40.1. G1. 0285H - 6.58 mm OD, 278 mm TL. H. *Bassanago albescens* SSF 40.3. H1. PEM 13795 (RUSI 28279) - 7.5 mm OD, 570 mm TL. H2. PEM 14207 - 9.8 mm OD, 723 mm TL. Scale bars 1 mm (—) or 0.1 mm (┌┐).



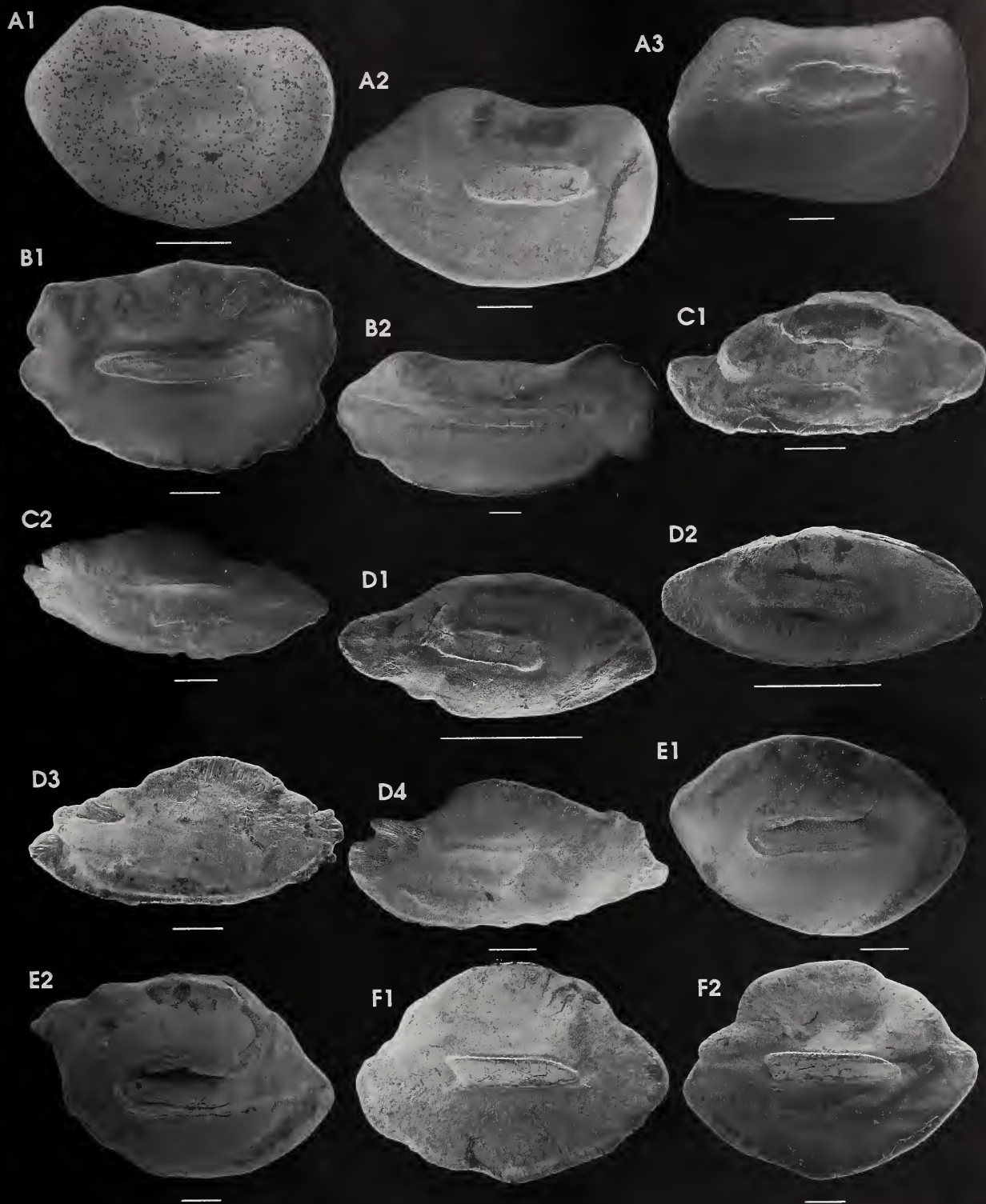


Plate 4. CONGRIDAE 62 ctd. A. *Bathyroconger vicinus* SSF 40.5. A1. PEM 14641 - 4.3 mm OD, 456 mm TL. A2. PEM 14640 - 6.3 mm OD, 477 mm TL. A3. PEM 14620 - 7.4 mm OD, 760 mm TL. B. *Coloconger scholesi* SSF 40.6. B1. PEM 14895 (RUSI 35559) - R. 6.5 mm OD, 268 mm TL. B2. PEM 14894 (RUSI 35580) - R. 10.5 mm OD, 359 mm TL. C. *Conger cinereus* SSF 40.7. C1. PEM 10347 - R. 5.7 mm OD, 630 mm TL. C2. PEM 0767 - L. 7.64 mm OD, 986 mm TL. D. *C. wilsoni* SSF 40.8. D1. PEM 10427 - R. 2.8 mm OD, 178 mm TL. D2. PEM 10428 - R. 3.0 mm OD, 205 mm TL. D3. PEM 15211 - R. 7.16 mm OD, 735 mm TL. D4. PEM 15229 - R. 7.46 mm OD, 742 mm TL. E. *Gnathophis capensis* SSF 40.9. E1. PEM 12595 - L. 6.8 mm OD, 306 mm TL. E2. PEM 12750 (RUSI 28275) - L. 9.1 mm OD, 393 mm TL. F. *Rhechias wallacei* SSF 40.11. F1. PEM 13044 (RUSI 28495) - 7.6 mm OD, 433 mm TL. F2. PEM 13058 (RUSI 28495) - 7.9 mm OD, 450 mm TL. Scale bars 1 mm (—).

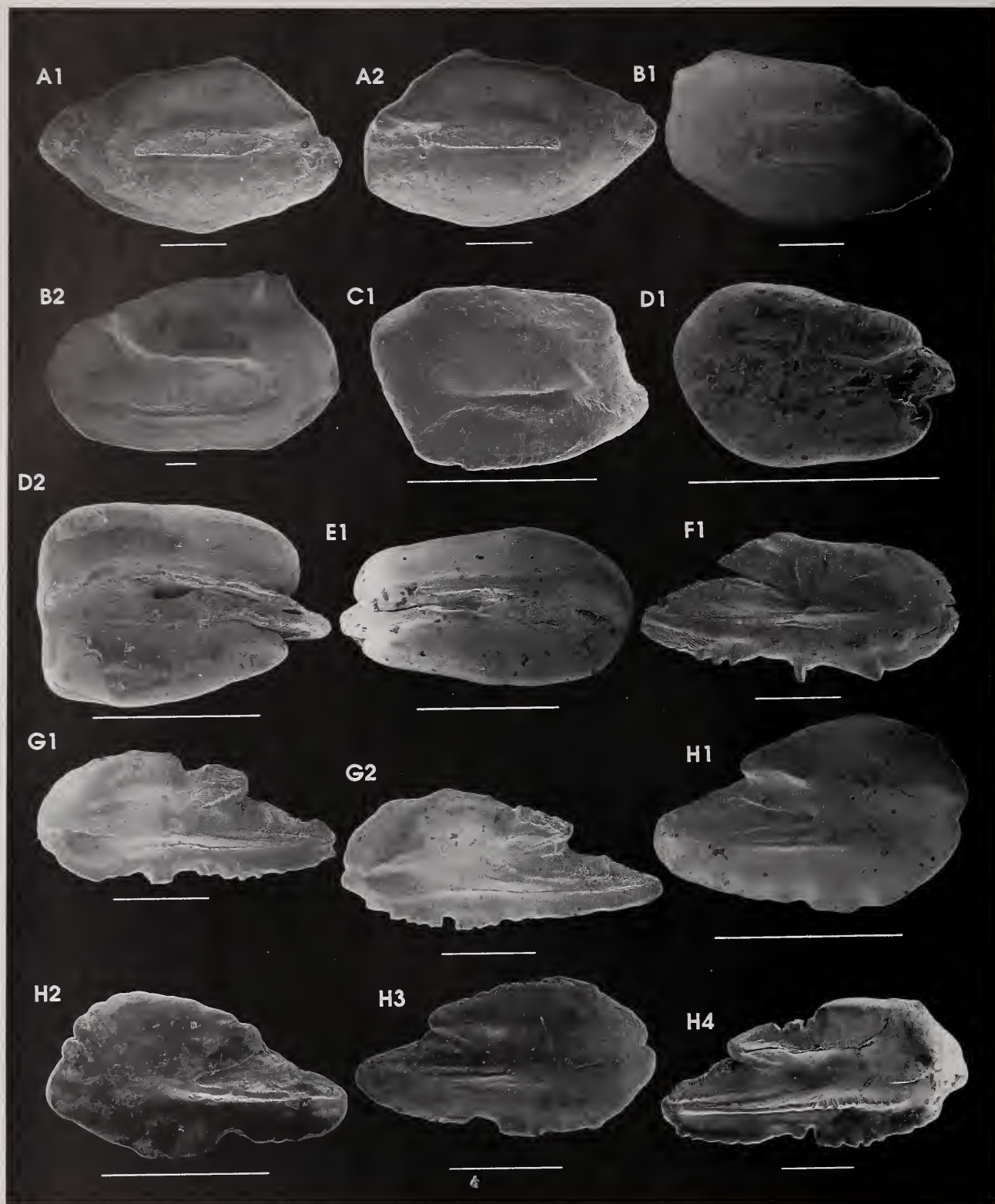


Plate 5. CONGRIDAE 62 ctd. A. *Uroconger lepturus* SSF 40.12. A1. PEM 15488 (RUSI 40548) - L. 4.75 mm OD, c. 319 mm TL. A2. PEM 15488 - R. B. *Muraenesox bagio* SSF 45.1. B1. PEM 8829 - L. 4.8 mm OD, 470 mm TL. B2. PEM 7948 - R. 11.4 mm OD, 1805 mm TL. DERICHTHYIDAE 63. C. *Nessorhamphus ingolfianus* SSF 49.2. C1. PEM 13365 - L. 1.5 mm OD, 449 mm TL. SERRIVOMERIDAE 64. D. *Serrivomer beanii* SSF 48.1. D1. 0909H - L. 1.25 mm OD, 420 mm TL. D2. 0904H - R. 1.8 mm OD, 715 mm TL. E. *Serrivomer* sp. A. SSF 48.-. E1. PEM 13145 - R. 2.1 mm OD, 856 mm TL. CLUPEIDAE 69. F. *Dussumieria elopsoidea* SSF 54.-. F1. PEM 15392 (RUSI 40589) - R. 3.75 mm OD, 179 mm TL. G. *Etrumeus teres* SSF 54.1. G1. PEM 15692 (RUSI 42664) - L. 3.05 mm OD, 183 mm TL. G2. PEM 15691 (RUSI 42664) - L. 3.4 mm OD, 180 mm TL. H. *E. whiteheadi* SSF 54.2. H1. PEM 10851 - R. 1.8 mm OD, 95 mm TL. H2. PEM 7688 (RUSI 28489) - L. 2.1 mm OD, 95 mm TL. H3. PEM 7693 (RUSI 28489) - R. 2.3 mm OD, 135 mm TL. H4. PEM 4657 - R. 4.39 mm OD, 227 mm TL. Scale bars 1 mm (—).



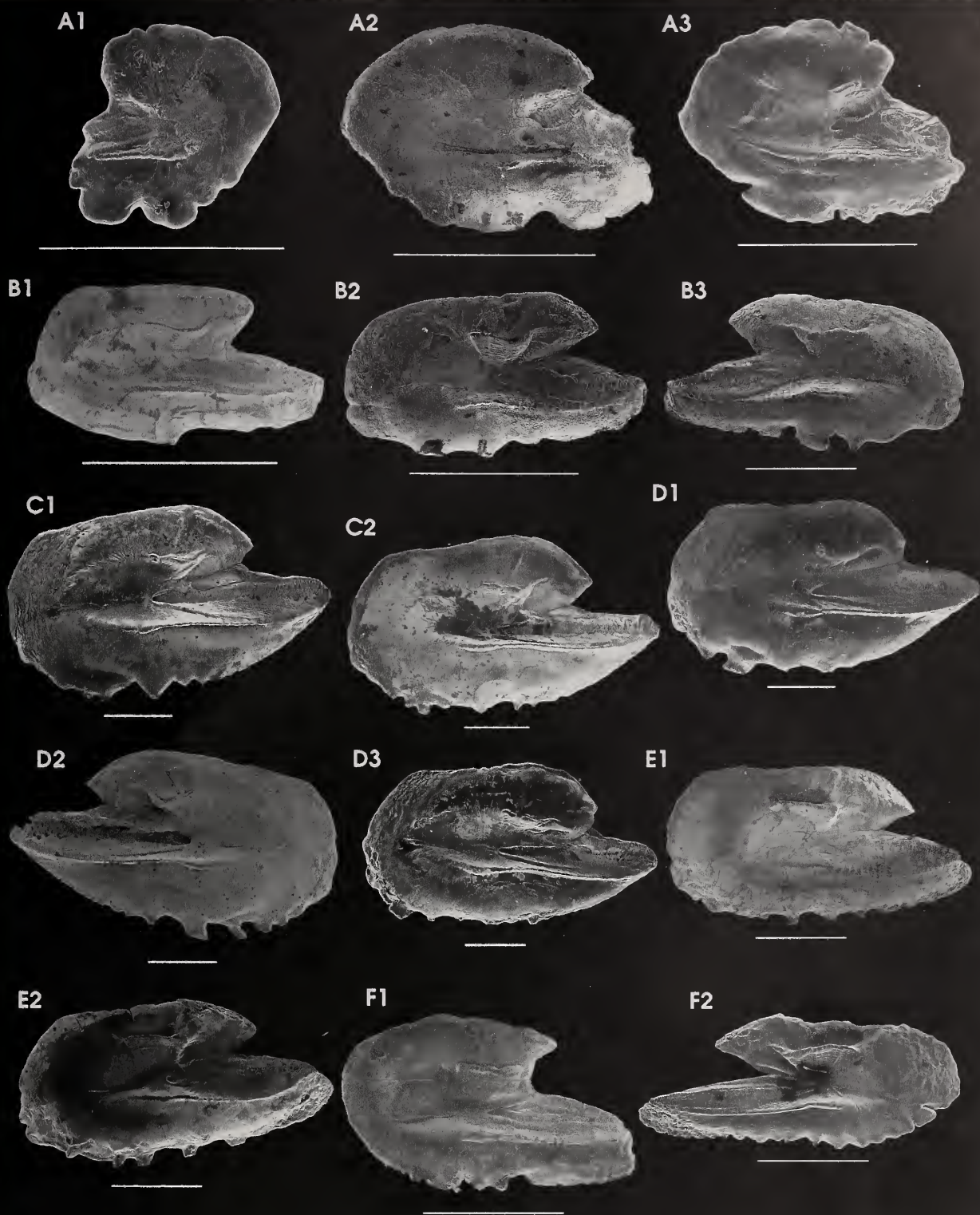


Plate 6. CLUPEIDAE 69 ctd. A. *Gilchristella aestuaria* SSF 54.3. A1. PEM 2889 - R. 1.04 mm OD, 36 mm TL. A2. PEM 2154 - L. 1.64 mm OD, 68 mm TL. A3. PEM 2224 - L. 1.8 mm OD, 75 mm TL. B. *Herklotsichthys quadrimaculatus* SSF 54.4. B1. 1257H - L. 1.55 mm OD, 66 mm TL. B2. PEM 15390 (RUSI 40586) - L. 1.9 mm OD, 84 mm TL. B3. PEM 15381 (RUSI 40587) - R. 2.75 mm OD, 131 mm TL. C. *Hilsa kelee* SSF 54.5. C1. 0187H - L. 4.8 mm OD, 190 mm TL. C2. 0186H - L. 4.85 mm OD, 185 mm TL. D. *Pellona diuchela* SSF 54.7. D1. PEM 15438 (RUSI 40555) - L. 4.7 mm OD, 173 mm TL. D2. PEM 0353 - R. 5.0 mm OD, 182 mm TL. D3. PEM 15439 (RUSI 40555) - L. 5.05 mm OD, 181 mm TL. E. *Sardinella albella* SSF 54.8. E1. PEM 14553 (RUSI 31405) - L. 3.6 mm OD, 170 mm TL. E2. PEM 14554 (RUSI 31394) - L. 3.7 mm OD, 172 mm TL. F. *S. aurita* SSF 54.9. F1. PEM 15499 - L. 2.3 mm OD, 129 mm TL. F2. PEM 15498 - R. 2.85 mm OD, 152 mm TL. Scale bars 1 mm (—).



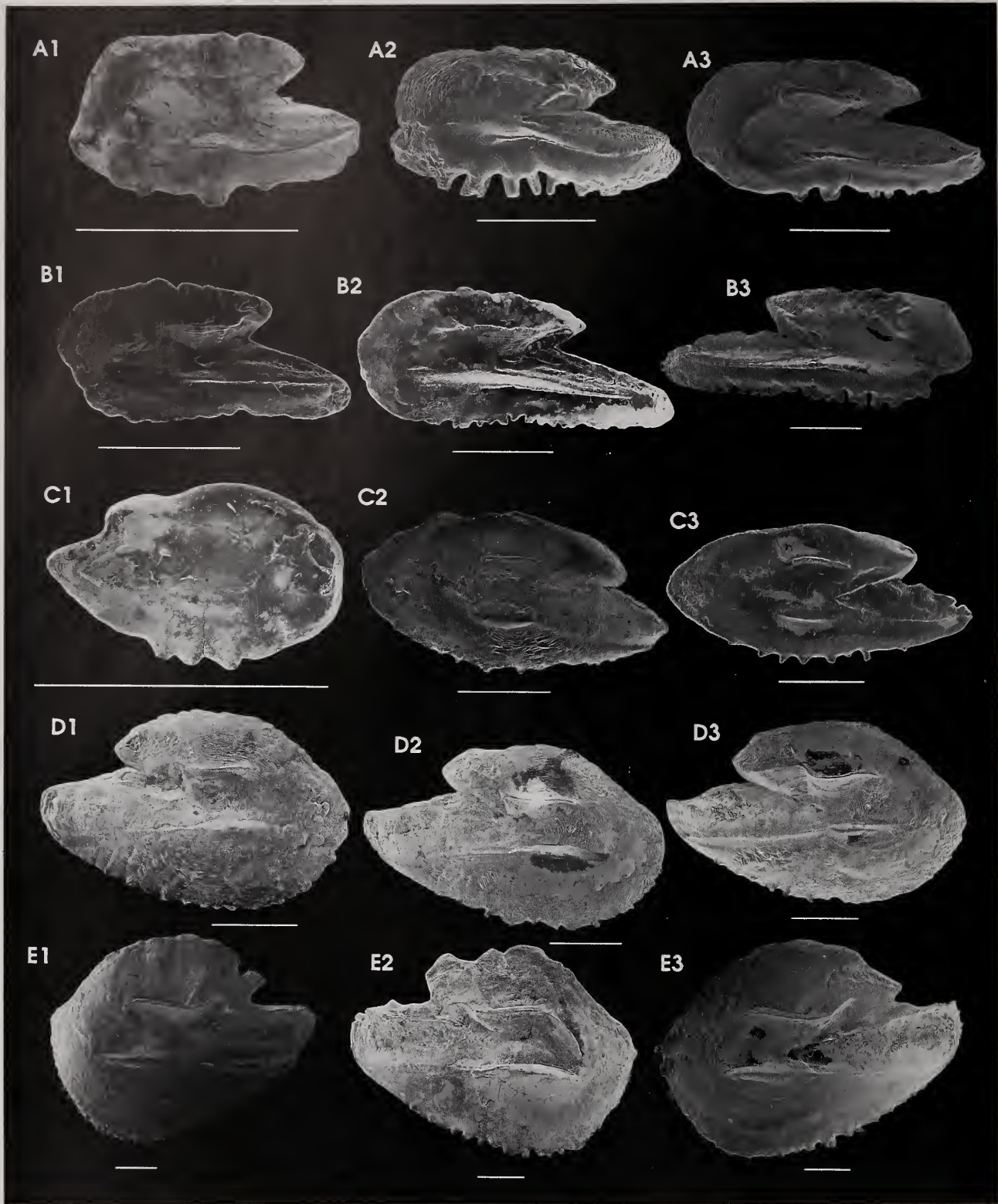


Plate 7. CLUPEIDAE 69 ctd. A. *Sardinella gibbosa* SSF 54.10. A1. PEM 12452 - L. 1.45 mm OD, 114 mm TL. A2. PEM 15492 (RUSI 40551) - L. 2.6 mm OD, 144 mm TL. A3. PEM 12451 - L. 3.3 mm OD, 180 mm TL. B. *Sardinops ocellatus* SSF 54.12. B1. PEM 7294 - L. 2.3 mm OD, 121 mm TL. B2. PEM 7694 (RUSI 34151) - L. 3.5 mm OD, 190 mm TL. B3. PEM 10867 - R. 4.6 mm OD, 244 mm TL. ENGRAULIDAE 70. C. *Engraulis japonicus* SSF 55.1. C1. PEM 3815 - R. 1.05 mm OD, 46 mm TL. C2. PEM 12777 - L. 3.4 mm OD, 128 mm TL. C3. PEM 7374 (RUSI 28283) - L. 3.9 mm OD, 150 mm TL. D. *Thyssa setirostris* SSF 55.5. D1. PEM 15303 (RUSI 36865) - R. 3.75 mm OD, 111 mm TL. D2. PEM 15314 - R. 4.55 mm OD, 130 mm TL. D3. PEM 15308 - R. 4.9 mm OD, 144 mm TL. E. *T. vitrirostris* SSF 55.6. E1. PEM 11735 (RUSI 28281) - L. 6.9 mm OD, 175 mm TL. E2. PEM 15301 - R. 7.06 mm OD, 170 mm TL. E3. PEM 15282 (RUSI 36877) - L. 7.22 mm OD, 184 mm TL. Scale bars 1 mm (—).



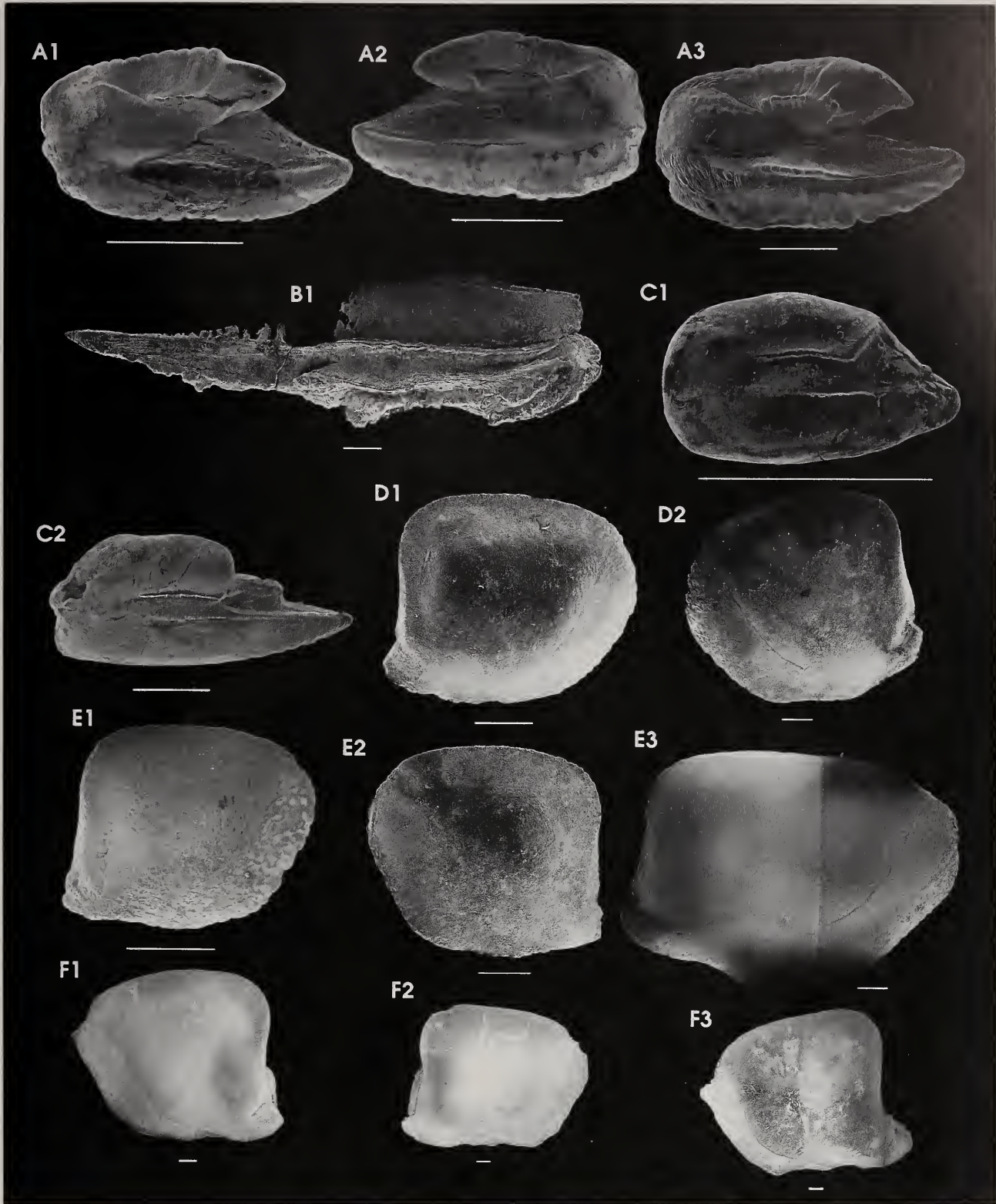


Plate 8. **CHIROCENTRIDAE 71.** A. *Chirocentrus dorab* SSF 56.1. A1. PEM 9349 - L. 2.8 mm OD, 212 mm FL. A2. PEM 9350 - R. 2.7 mm OD, 196 mm FL. A3. PEM 6431 - L. 4.10 mm OD, 365 mm FL. **CHANIDAE 72.** B. *Chanos chanos* SSF 58.1. B1. 0230H - R. c.15.0 mm OD, 720 mm TL. **GONORYNCHIDAE 73.** C. *Gonorynchus gonorynchus* SSF 57.1. C1. PEM 5135 - L. 1.35 mm OD, 117 mm TL. C2. PEM 13061 - L. 3.9 mm OD, 296 mm TL. **ARIIDAE 108.** D. *Galeichthys ater* SSF 59.2. D1. PEM 10413 - 5.2 mm OD, 94 mm TL. D2. PEM 6950 - 9.4 mm OD, 231 mm TL. E. *G. feliceps* SSF 59.3. E1. PEM 3129 - 3.21 mm OD, 52 mm TL. E2. PEM 3121 - 5.62 mm OD, 121 mm TL. E3. PEM 15015 (RUSI 35598) - 12.2 mm OD, 347 mm TL. F. *Galeichthys* sp. SSF 59.-. F1. PEM 10361 - 13.4 mm OD, 428 mm TL. F2. PEM 9217 - 13.9 mm OD, 478 mm TL. F3. PEM 10359 - 16.5 mm OD, 578 mm TL. Scale bars 1 mm (—).



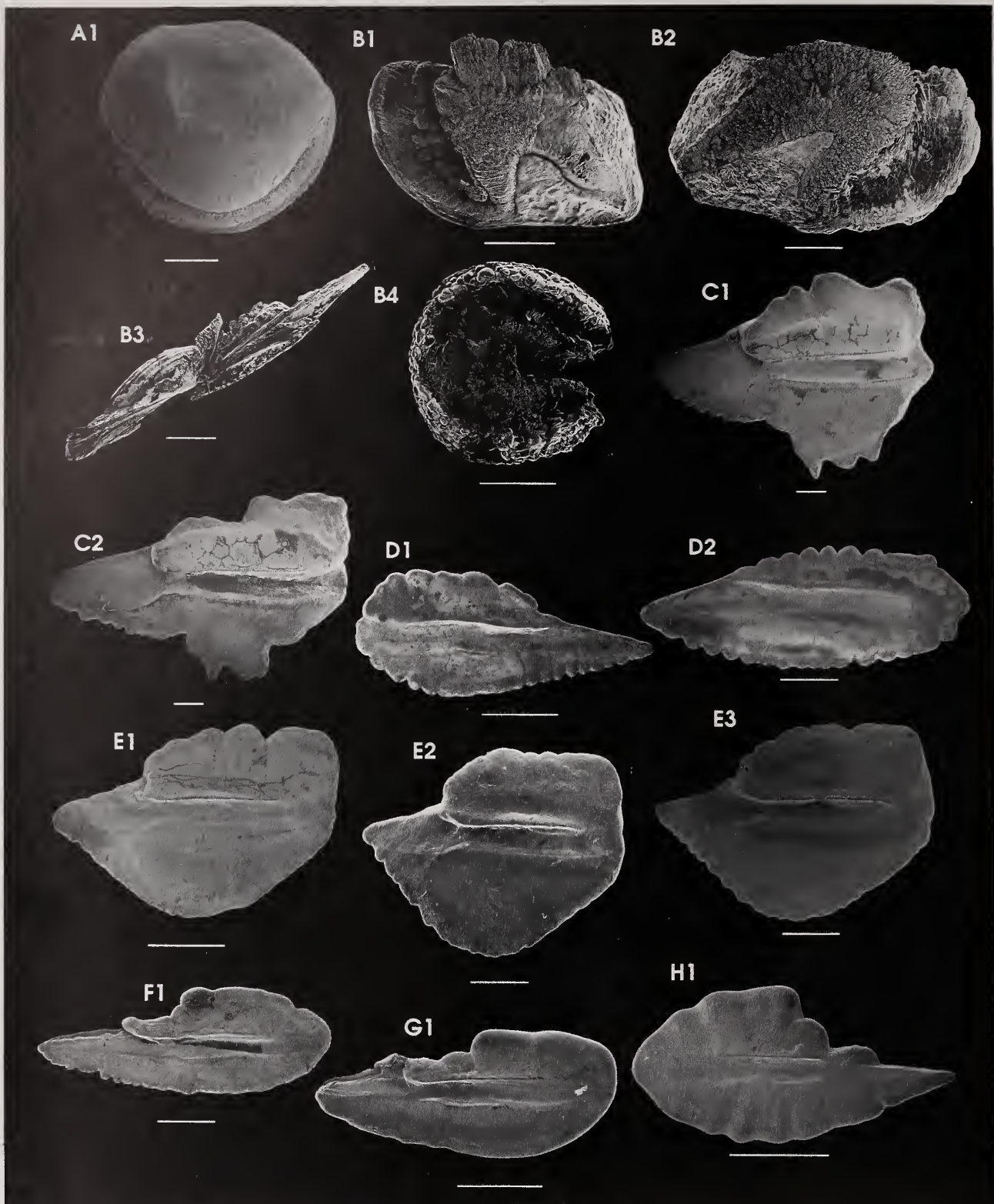


Plate 9. **PLOTOSIDAE 109.** A. *Plotosus lineatus* SSF 60.1. A1. PEM 6470 - 4.7 mm OD, 223 mm TL. B. *P. nkunga* SSF 60.2. B1. PEM 9928 - 4.3 mm OD, 395 mm TL. B2. PEM 2714 (utricular or lapillus) 5.8 mm OD, 600 mm TL. B3. PEM 2714 (saccular or sagitta) 7.26 mm OD. B4. PEM 2714 (lagenar or asteriscus) 2.85 mm OD. **ARGENTINIDAE 131.** C. *Argentina silus* SSF 61.-. C1. PEM 7978 - R. 10.2 mm OD. C2. PEM 7973 - R. 11.3 mm OD. D. *Nansenia macrolepis* SSF 61.3. D1. PEM 13162 - L. 4.1 mm OD, 102 mm SL. D2. PEM 5058 (RUSI 14112) - R. 6.18 mm OD, 123 mm SL. E. *Glossanodon semifasciatus* SSF 61.-. E1. PEM 12907 (RUSI 34087) - R. 4.0 mm OD, 111 mm TL. E2. PEM 12908 (RUSI 34087) - R. 4.8 mm OD, 148 mm TL. E3. PEM 12904 (RUSI 34087) - R. 5.2 mm OD, 150 mm TL. **BATHYLAGIDAE 132.** F. *Bathylagus antarcticus* SSF 62.1. F1. PEM 13084 - R. 5.3 mm OD, 230 mm SL. G. *B. bericoides* SSF 62.2. G1. PEM 13788 - R. 3.6 mm OD, 150 mm SL. H. *Bathylagus* sp. SSF 62.-. III. PEM 13085 - L. 3.3 mm OD, 148 mm SL. Scale bars 1 mm (—).



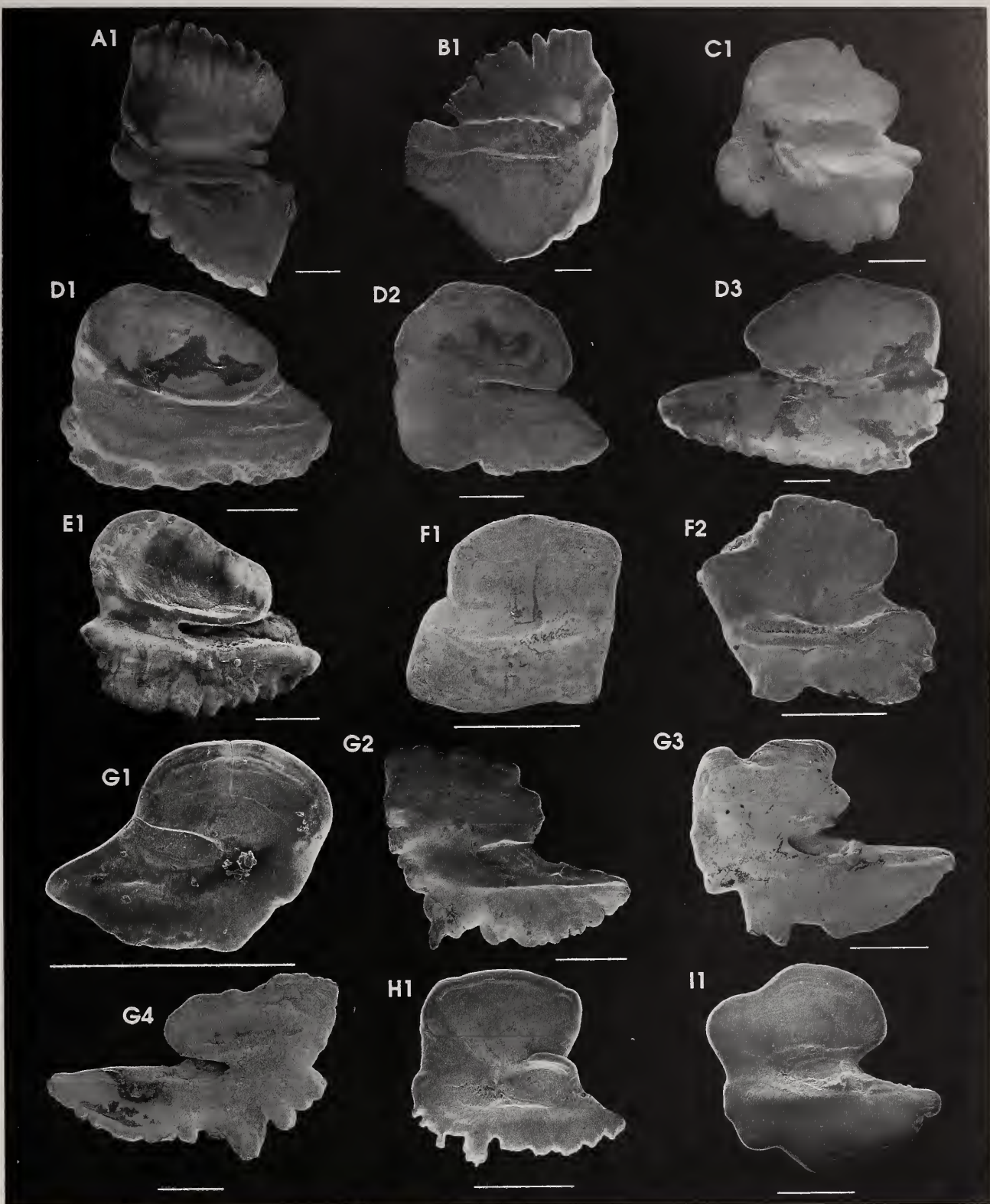


Plate 10. OPISTHOPROCTIDAE 133. A. *Opisthoproctus grimaldii* SSF 63.1. A1. PEM 14812 - L. 6.65 mm OD. B. *O. soleatus* SSF 63.2. B1. PEM 7964 - R. 6.8 mm OD, 81 mm SL. C. *Winteria telescopa* SSF 63.4. C1. PEM 13328 - L. 4.1 mm OD, 146 mm TL. ALEPOCEPHALIDAE 134. D. *Alepocephalus australis* SSF 64.1. D1. PEM 13781 - L. 3.4 mm OD, 230 mm TL. D2. PEM 13774 - L. 3.9 mm OD, 318 mm TL. D3. PEM 13481 - R. 6.8 mm OD, 469 mm TL. E. *Alepocephalus* sp. SSF 64.-. E1. PEM 14473 (RUSI 31407) - L. 4.4 mm OD, 294 mm TL. F. *Xenodermichthys copei* SSF 64.18. F1. PEM 14889 (RUSI 35524) - R. 1.9 mm OD, c.122 mm TL. F2. PEM 13394 - L. 2.5 mm OD, 163 mm TL. SEARSIIDAE 135. G. *Persparsia kopua* SSF 65.7. G1. PEM 13401 - R. 1.3 mm OD, 64 mm TL. G2. PEM 13269 - L. 3.5 mm OD, 159 mm TL. G3. PEM 13200 - L. 3.7 mm OD, 176 mm TL. G4. PEM 15358 - R. 4.5 mm OD, 166 mm TL. H. *?Sagamichthys schnakenbecki* A. SSF 65.8A. H1. PEM 13331 - L. 2.9 mm OD, 225 mm TL. I. *?Sagamichthys schnakenbecki* B SSF 65.8B. I1. PEM 13266 - L. 2.5 mm OD, 141 mm TL. Scale bars 1 mm (—).

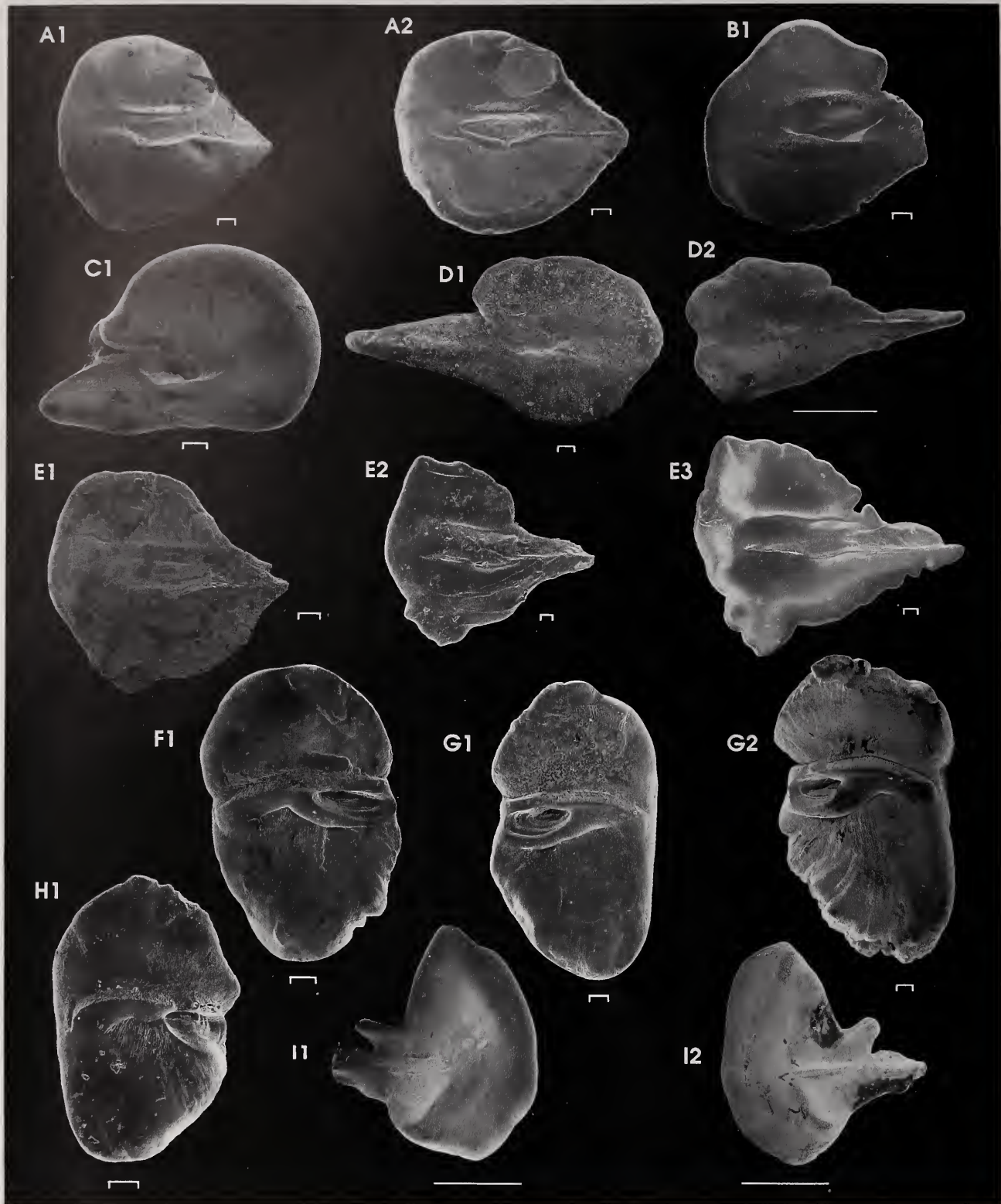


Plate 11. GONOSTOMATIDAE 144. A. *Bonapartia pedaliota* SSF 74.1. A1. 0363H - L. 1.3 mm OD. A2. 0341H - L. 1.3 mm OD. B. *Gonostoma atlanticum* SSF 74.11. B1. PEM 3408 - L. c.1.2 mm OD, c.65 mm SL. C. *G. bathyphilum* SSF 74.12. C1. PEM 3442 - R. 1.25 mm OD, c.125 mm SL. D. *G. elongatum* SSF 74.14. D1. PEM 1729 - R. 2.11 mm OD, 128 mm SL. D2. PEM 13086 - L. 3.4 mm OD, 235 mm SL. STERNOPTYCHIDAE 145. E. *Mauroliscus muelleri* SSF 75.1. E1. PEM 14742 - L. 1.3 mm OD, 37 mm TL. E2. PEM 7121 - L. 1.7 mm OD, 52 mm TL. E3. PEM 7001 (RUSI 37440) - L. 2.0 mm OD, 57 mm TL. F. *Argyropelecus affinis* SSF 75.4. F1. PEM 0937 - L. 1.25 mm OD. G. *A. gigas* SSF 75.5. G1. PEM 13132 - R. 1.8 mm OD, 85 mm SL. G2. PEM 12055 - R. 2.15 mm OD, c.90 mm SL. H. *A. sladeni* SSF 75.7. H1. 0261H - L. 0.95 mm OD, 44 mm TL. I. *Polyipnus indicus* SSF 75.8. I1. PEM 3486 (SAM 28717) - R. 2.65 mm OD, c.45 mm SL. I2. PEM 14914 (RUSI 35518) - L. 3.0 mm OD, 46 mm TL. Scale bars 0.1 mm (—) or 1 mm (—).



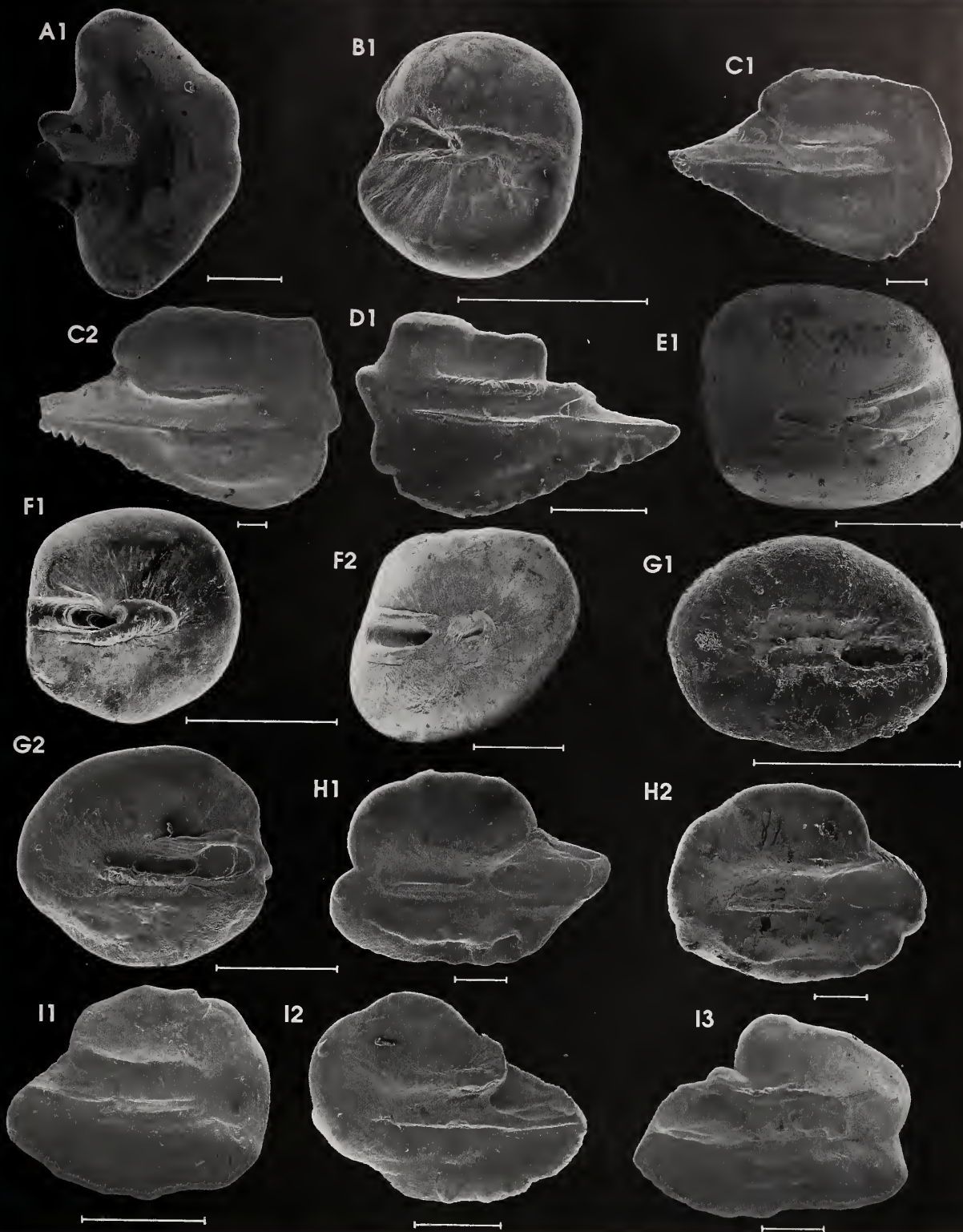


Plate 12. STERNOPTYCHIIDAE 145 ctd. A. *Polyipnus polli* SSF 75.10. A1. 0260H - R. 20 mm SL. B. *Sternoptyx diaphana* SSF 75.11. B1. PEM 3390 - R. 0.7 mm OD, c.34 mm SL. PHOTICHTHYIDAE 146. C. *Photichthys argenteus* SSF 73.4. C1. PEM 14064 - R. 3.6 mm OD, 188 mm TL. C2. PEM 9017 (RUSI 37480) - R. 5.2 mm OD. D. *Vinciguerrria lucetia* SSF 73.-. D1. PEM 0532 - L. 1.75 mm OD. CHAULIODONTIDAE 147. E. *Chauliodus minimus* SSF 68.1. E1. PEM 14754 - R. 1.2 mm OD, 219 mm TL. F. *C. sloani* SSF 68.2. F1. PEM 14915 (RUSI 35602) - R. 0.8 mm OD, 126 mm TL. F2. PEM 14919 (RUSI 35602) - R. 1.55 mm OD, 263 mm SL. STOMIIDAE 148. G. *Stomias boa boa* SSF 67.2. G1. PEM 14918 (RUSI 35523) - L. 0.7 mm OD, 239 mm TL. G2. PEM 13199 - R. 1.2 mm OD, 245 mm TL. ASTRONESTHIDAE 149. II. *Astronesthes boulengeri* SSF 69.1. H1. PEM 13302 - L. 2.7 mm OD, 237 mm TL. H2. PEM 13301 - L. 2.6 mm OD, 249 mm TL. I. *A. indicus* SSF 69.3. I1. PEM 13300 - R. 1.2 mm OD, 132 mm TL. I2. PEM 13298 - L. 1.8 mm OD, 210 mm TL. I3. PEM 13297 - R. 2.4 mm OD, 225 mm SL. Scale bars 0.5 mm (—|—).

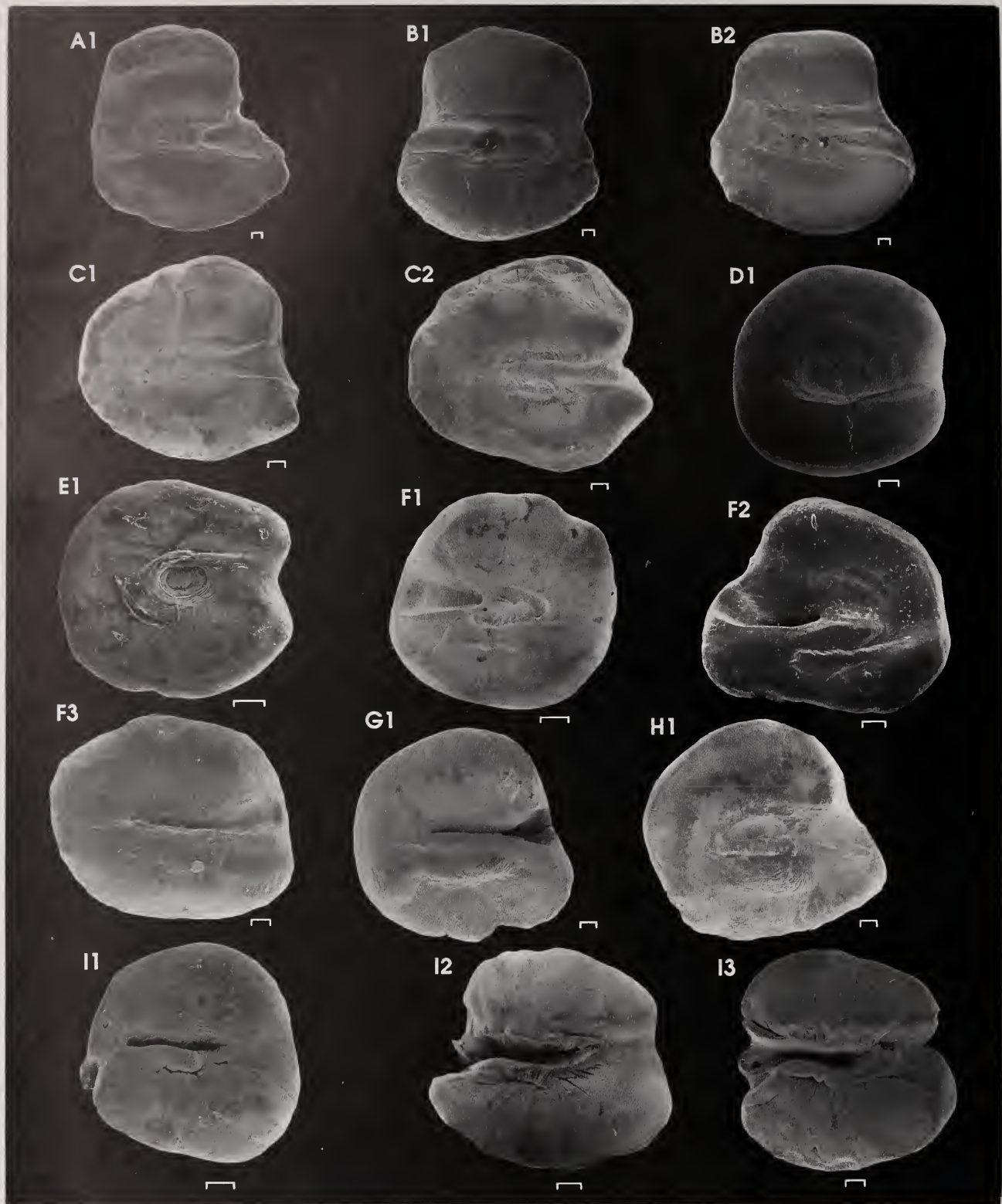


Plate 13. ASTRONESTHIIDAE 149 ctd. A. *Borostomias mononema* SSF 69.8. A1. PEM 13272 - L. 2.1 mm OD, 303 mm TL. B. *Neonesthes capensis* SSF 69.9. B1. PEM 3470 - R. 1.9 mm OD, c.155 mm SL. B2. PEM 13395 - L. 1.9 mm OD, 159 mm SL. MELANOSTOMIIDAE 150. C. *Echiostoma barbatum* SSF 72.6. C1. PEM 14160 (RUSI 28286) - L. 1.5 mm OD, 223 mm TL. C2. PEM 14159 (RUSI 28285) - L. 1.6 mm OD, 243 mm TL. D. *Eustomias lipochirus* SSF 72.10. D1. PEM 13347 - L. 1.1 mm OD, 286 mm TL. E. *E. schmidtii* SSF 72.11. E1. PEM 14916 (RUSI 35522) - L. 0.8 mm OD, 169 mm TL. F. *Melanostomias niger* SSF 72.18. F1. PEM 12054 - R. (lost). F2. PEM 15363 (RUSI 38318) - R. 1.15 mm OD, 210 mm TL. F3. PEM 13273 - L. 1.4 mm OD, 287 mm TL. G. *Opostomias micripnus* SSF 72.21. G1. PEM 13194 - L. 1.5 mm OD, 270 mm TL. H. *Trigonolampa miriceps* SSF 72.25. H1. PEM 7965 - L. 1.5 mm OD, 154 mm SL. MALACOSTEIDAE 151. I. *Malacosteus niger* SSF 71.4. I1. PEM 3451 (SAM 28704) - R. 0.85 mm OD, c.100 mm SL. I2. PEM 3387 (SAM 28703) - R. 1.0 mm OD, c.131 mm SL. I3. PEM 13140 - R. 1.1 mm OD, 144 mm TL. Scale bars 0.1 mm (—).



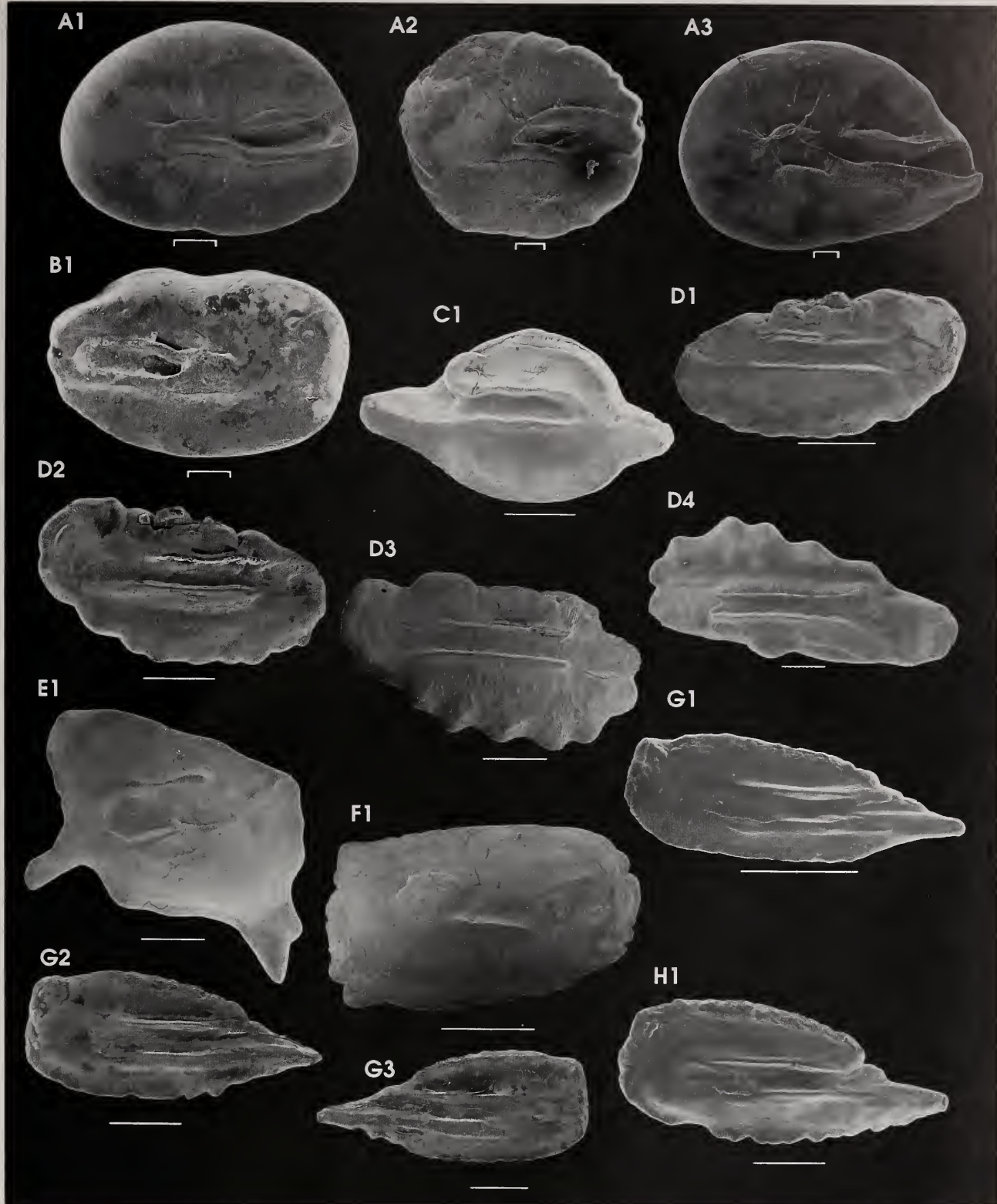


Plate 14. IDIACANTHIDAE 152. A. *Idiacanthus atlanticus* SSF 70.1. A1. PEM 1737 - L. 0.48 mm OD, 212 mm SL. A2. PEM 14917 (RUSI 35525) - L. 0.9 mm OD, 185 mm TL. A3. PEM 13474 - L. 1.4 mm OD, 450 mm TL. B. *I. fasciola* SSF 70.2. B1. PEM 14920 (RUSI 35520) - L. 0.8 mm OD, 206 mm TL. CHLOROPHTHALMIDAE 154. C. *Bathysauropsis gracilis* SSF 76.7. C1. PEM 15355 (RUSI 38216) - R. 4.45 mm OD, 225 mm TL. D. *Chlorophthalmus punctatus* SSF 76.9. D1. PEM 12792 - R. 3.9 mm OD, 110 mm SL. D2. PEM 15027 (RUSI 35556) - L. 4.4 mm OD, 149 mm TL. D3. PEM 13041 (RUSI 28290) - L. 5.1 mm OD, 200 mm TL. D4. PEM 5039 - L. 7.62 mm OD, 231 mm TL. SCOPELARCHIDAE 155. E. *Benthalbella macropinna* SSF 77.2. E1. PEM 13412 - L. 5.9 mm OD, 267 mm TL. F. *Scopelarchus analis* SSF 77.6. F1. 0257H - R. 3.45 mm OD, 56 mm SL. NOTOSUDIDAE 156. G. *Scopelosaurus ahlstromi* SSF 78.3. G1. PEM 13249 - L. 3.1 mm OD, 110 mm TL. G2. PEM 15360 (RUSI 38220) - L. 4.2 mm OD, 188 mm TL. G3. PEM 15359 (RUSI 38220) - R. 4.9 mm OD, 201 mm TL. H. *S. meadi* SSF 78.6. H1. PEM 13332 - L. 4.9 mm OD, 225 mm TL. Scale bars 1 mm (—) or 0.1 mm (—).

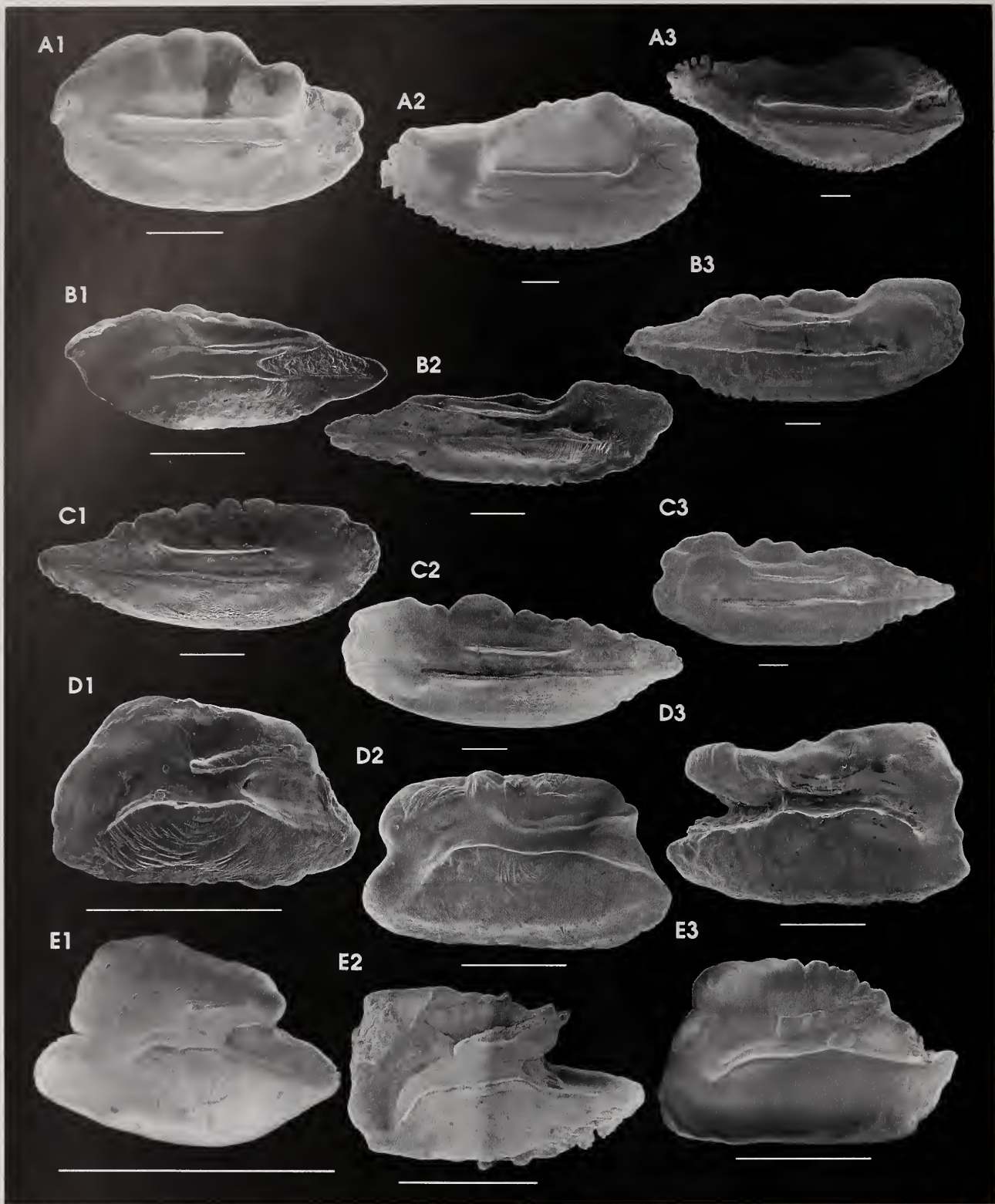


Plate 15. SYNODONTIDAE 157. A. *Bathysaurus ferox* SSF 79.1. A1. PEM 12144 - L. 4.4 mm OD, 236 mm SL. A2. PEM 13762 - L. 10.1 mm OD, 612 mm TL. A3. PEM 13761 - L. 11.1 mm OD, 615 mm TL. B. *Saurida gracilis* SSF 79.2. B1. PEM 15447 (RUSI 40565) - L. 3.4 mm OD, 111 mm TL. B2. PEM 8330 - R. 7.0 mm OD, 290 mm TL. B3. PEM 5072 - R. 11.18 mm OD, 350 mm TL. C. *S. undosquamis* SSF 79.3. C1. PEM 12455 - R. 5.7 mm OD, 159 mm TL. C2. PEM 12927 - L. 8.0 mm OD, 216 mm TL. C3. PEM 12826 (RUSI 28288) - L. 11.0 mm OD, 341 mm TL. D. *Synodus indicus* SSF 79.7. D1. PEM 4404 (RUSI 16062) - L. 1.6 mm OD, 102 mm TL. D2. PEM 7818 (RUSI 28287) - L. 3.3 mm OD, 264 mm TL. D3. PEM 1974 - R. 3.73 mm OD, 310 mm TL. E. *S. variegatus* SSF 79.9. E1. 1036H - L. 1.2 mm OD, 68 mm TL. E2. 1005H - L. 2.1 mm OD, 166 mm TL. E3. 1032H - L. 2.2 mm OD, 186 mm TL. Scale bars 1 mm (—).



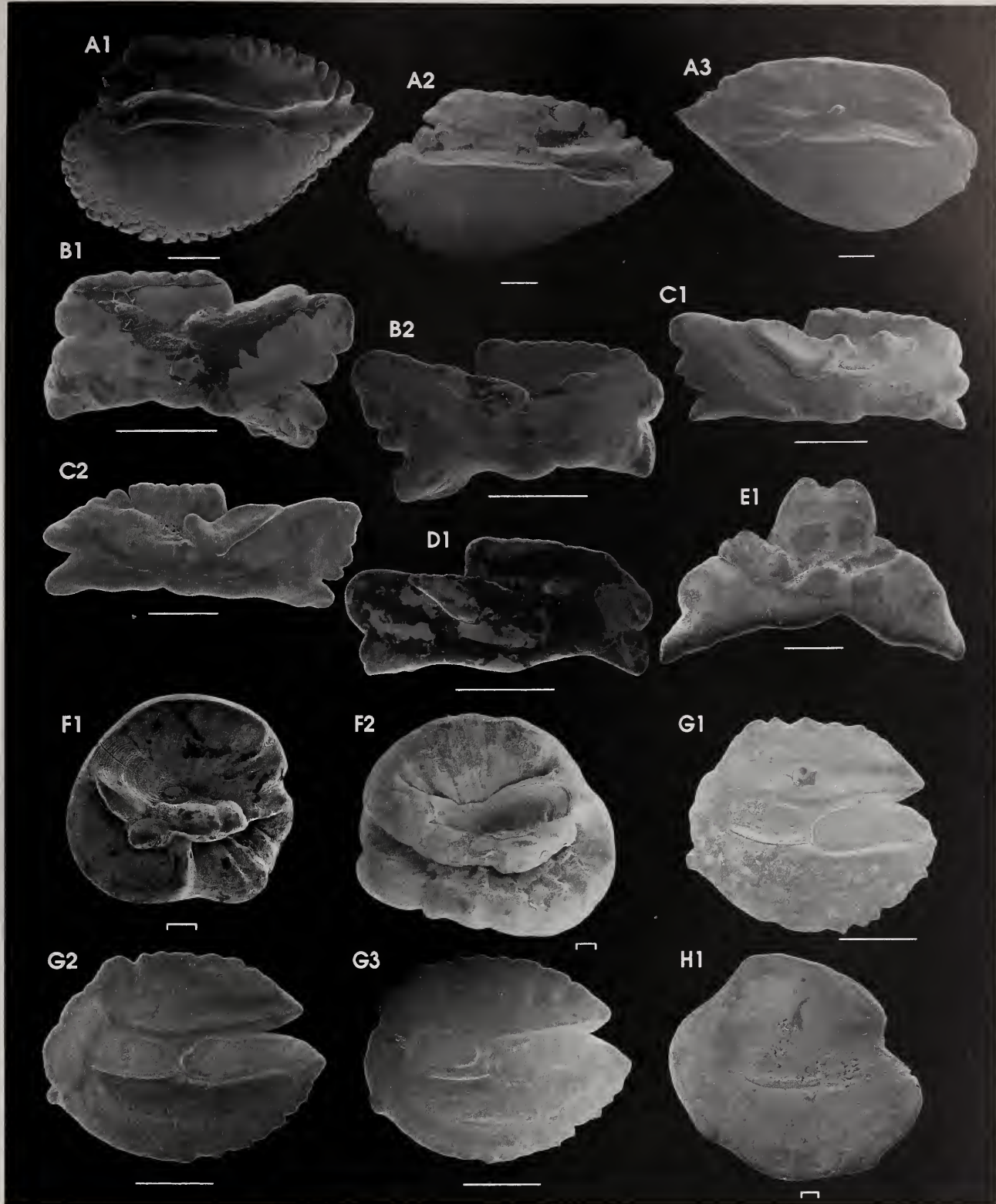


Plate 16. SYNODONTIDAE 157 ctd. A. *Trachinocephalus myops* SSF 79.10. A1. PEM 2582 - L. 6.84 mm OD, 170 mm TL. A2. 1386H - L. 9.48 mm OD, 236 mm TL. A3. PEM 5967 - R. 9.6 mm OD, 210 mm TL. PARALEPIDIDAE 159. B. *Lestidiops similis* SSF 81.2. B1. PEM 14144 (RUSI 28291) - L. 3.3 mm OD, 219 mm TL. B2. PEM 14149 (RUSI 28293) - R. 3.3 mm OD, 214 mm TL. C. *Lestrolepis intermedia* SSF 81.4. C1. PEM 5034 - R. 4.3 mm OD, 252 mm TL. C2. PEM 5035 - L. 4.75 mm OD, 254 mm TL. D. *Macroparalepis macrogeneion* SSF 81.6. D1. PEM 12315 - R. 3.3 mm OD, 275 mm TL. E. *Paralepis atlantica* SSF 81.-. E1. PEM 0966 - R. 5.84 mm OD. ALEPISAUROIDAE 163. F. *Alepisauros ferox* SSF 85.2. F1. PEM 15635 - 0.75 mm OD, 710 mm TL. F2. PEM 0931 - 1.3 mm OD. MYCTOPIIIDAE 166. G. *Benthosema fibulatum* SSF 86.1. G1. PEM 12960 (SAM 31648) - L. 3.5 mm OD, 77 mm TL. G2. PEM 12961 (SAM 31650) - L. 3.5 mm OD, 81 mm TL. G3. PEM 12945 (SAM 31652) - L. 3.6 mm OD, 81 mm TL. H. *B. suborbitalis* SSF 86.3. H1. 0870H - L. 1.6 mm OD. Scale bars 1 mm (—) or 0.1 mm (—).

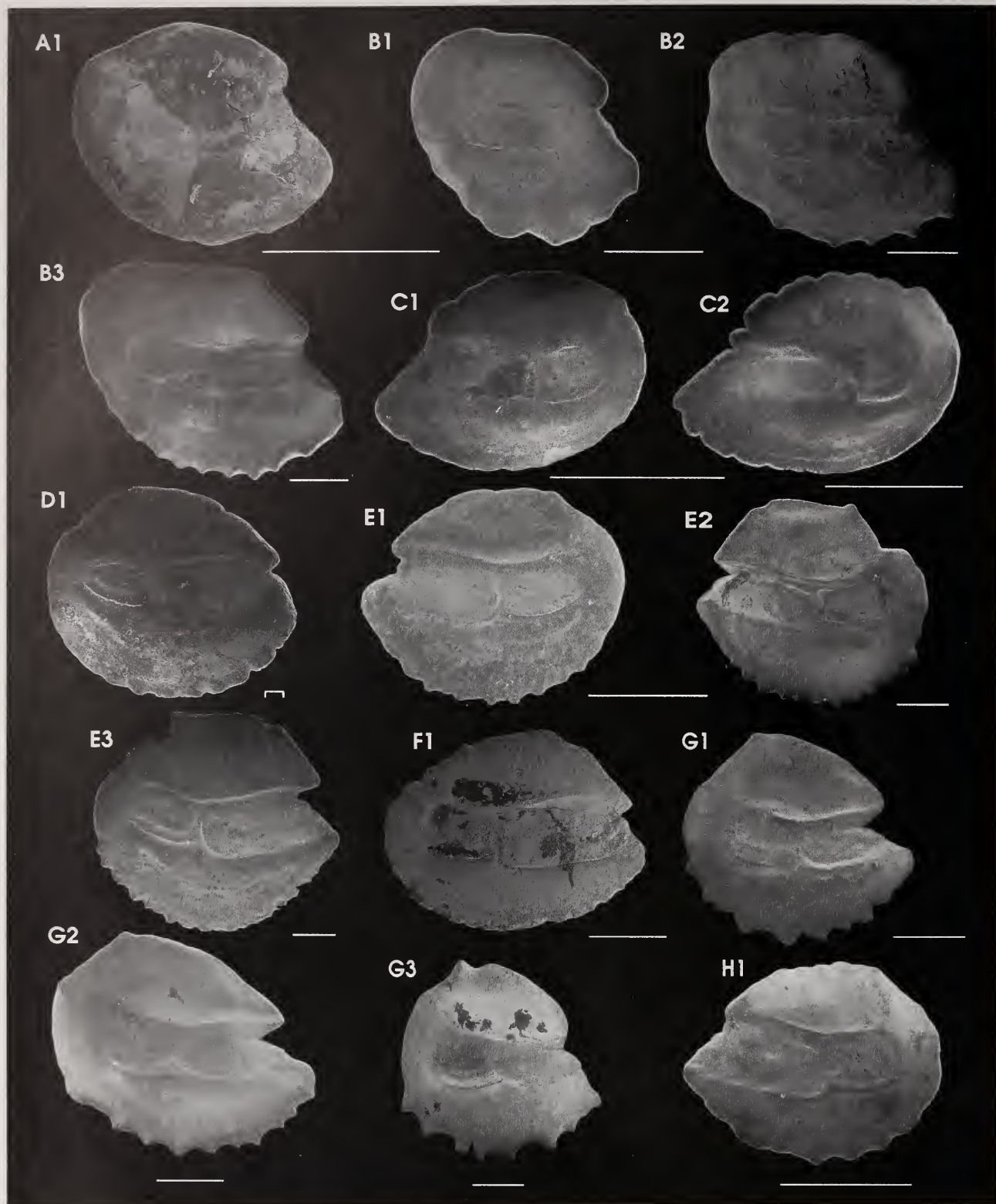


Plate 17. MYCTOPHIDAE 166 ctd. A. *Bolinichthys indicus* SSF 86.4. A1. PEM 7998 - L. 1.4 mm OD. B. *B. supralateralis* SSF 86.7. B1. PEM 13203 - L. 2.8 mm OD, 68 mm TL. B2. PEM 7860 - L. 4.3 mm OD, 93 mm SL. B3. PEM 13232 (SAM 32130) - L. 5.1 mm OD, 135 mm TL. C. *Ceratoscopelus warmingii* SSF 86.9. C1. PEM 1773 - R. 1.73 mm OD, 34 mm SL. C2. PEM 1772 - R. 3.1 mm OD, 39 mm SL. D. *Diaphus brachycephalus* SSF 86.13. D1. PEM 1761 - L. 1.59 mm OD, 31 mm SL. E. *D. effulgens* SSF 86.16. E1. PEM 1756 - R. 2.38 mm OD, 32 mm SL. E2. PEM 7881 - R. 4.8 mm OD, 83 mm SL. E3. PEM 13291 - L. 5.9 mm OD, 125 mm TL. F. *D. garmani* SSF 86.19. F1. 0835H - L. 3.4 mm OD. G. *D. hudsoni* SSF 86.20. G1. PEM 13934 - L. 3.5 mm OD, 59 mm TL. G2. PEM 13921 (SAM 31851) - L. 3.8 mm OD, 68 mm TL. G3. PEM 13984 - L. 4.3 mm OD, 85 mm TL. H. *D. jenseni* SSF 86.21. H1. PEM 1758 - R. 2.22 mm OD, 26 mm SL. Scale bars 1 mm (—) or 0.1 mm (┌).



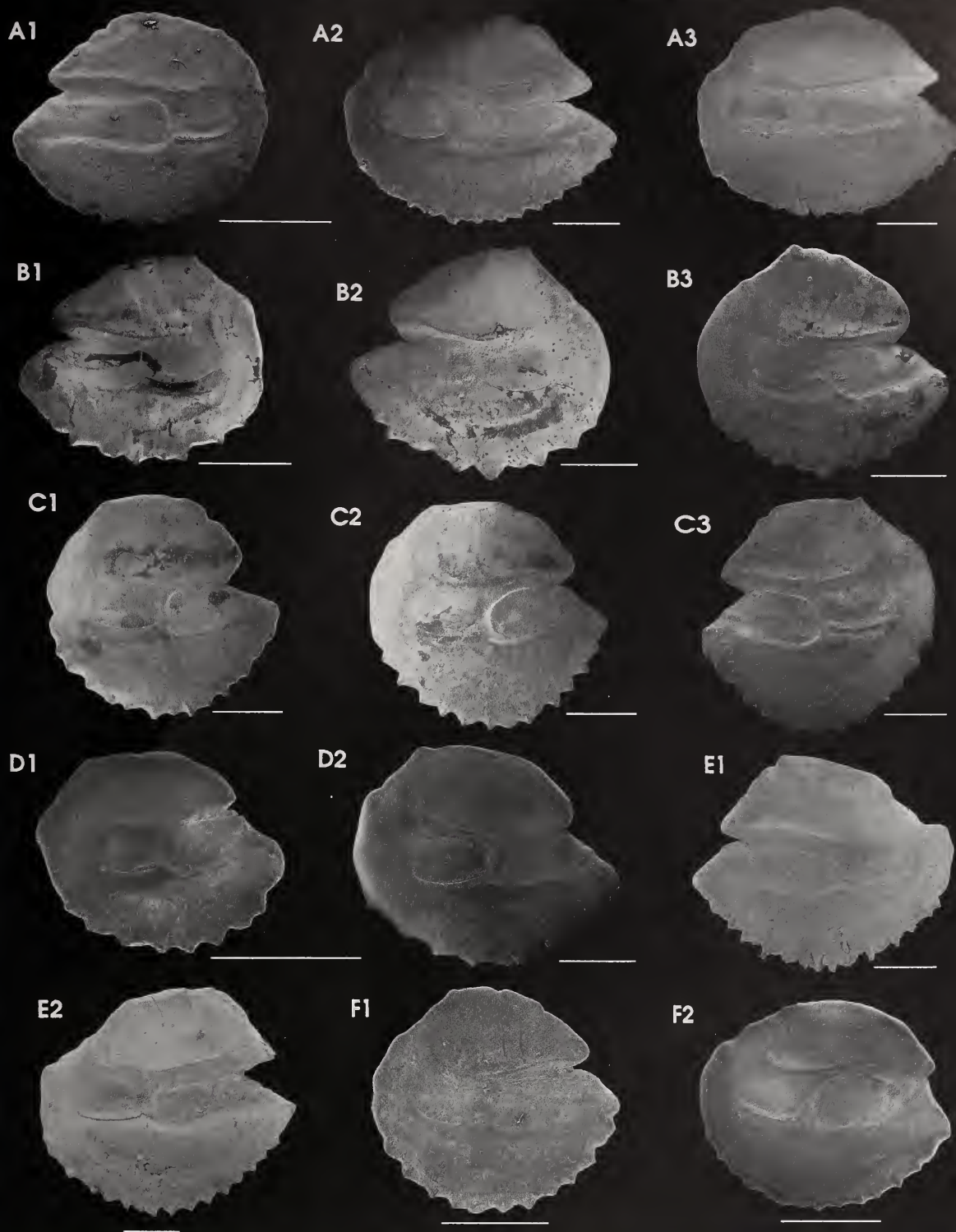


Plate 18. MYCTOPHIDAE 166 ctd. A. *Diaphus lucidus* SSF 86.23. A1. PEM 1767 - R. 2.38 mm OD, 35 mm SL. A2. PEM 13389 - L. 4.2 mm OD, 87 mm TL. A3. PEM 13388 - L. 4.6 mm OD, 104 mm TL. B. *D. meadi* SSF 86.26. B1. PEM 7590 - R. 2.8 mm OD, 36 mm SL. B2. PEM 7592 - R. 3.5 mm OD, 51 mm SL. B3. PEM 7593 - L. 3.7 mm OD, 48 mm SL. C. *D. metopoclampus* SSF 86.27. C1. PEM 7574 - L. 3.5 mm OD, 53 mm SL. C2. PEM 7882 - L. 3.8 mm OD, 52 mm SL. C3. 0360H - R. 4.1 mm OD, 62 mm SL. D. *D. mollis* SSF 86.28. D1. PEM 1759 - L. 1.68 mm OD, 28 mm SL. D2. PEM 13383 - L. 3.6 mm OD, 76 mm TL. E. *D. ostensfeldi* SSF 86.30. E1. PEM 13161 (SAM 32112) - R. 4.6 mm OD, 95 mm TL. E2. PEM 13160 (SAM 32112) - L. 4.9 mm OD, 113 mm TL. F. *D. perspicillatus* SSF 86.32. F1. PEM 1762 - L. 2.36 mm OD, 22 mm SL. F2. PEM 13292 (SAM 31826) - L. 2.6 mm OD, 47 mm TL. Scale bars 1 mm (—).

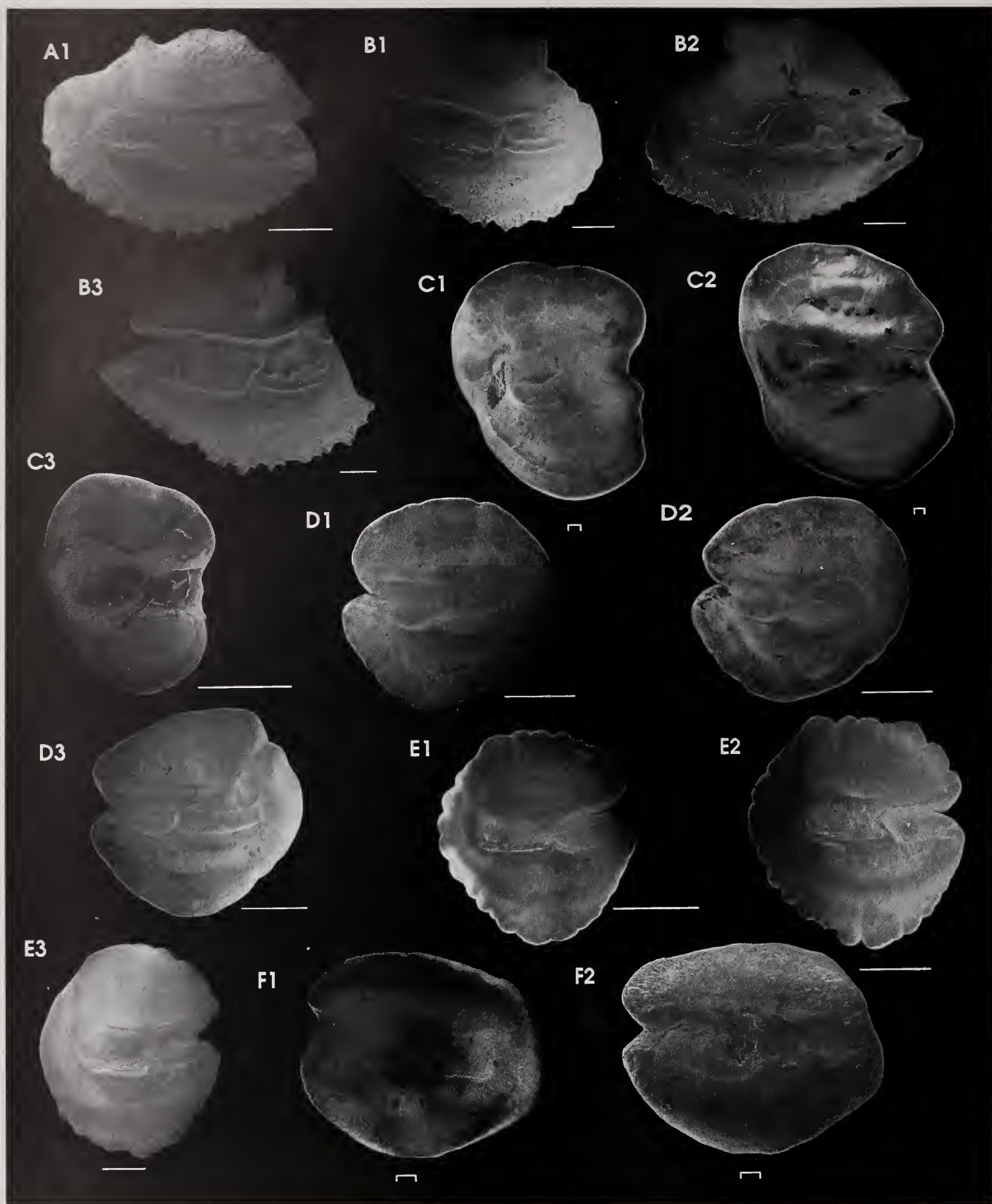


Plate 19. MYCTOPHIDAE 166 ctd. **A.** *Diaphus problematicus* SSF 86.34. **A1.** PEM 13192 (SAM 32053) - L. 4.7 mm OD, 102 mm TL. **B.** *D. watasei* SSF 86.41. **B1.** PEM 13026 (SAM 31657) - R. 5.6 mm OD, 128 mm TL. **B2.** PEM 13027 (SAM 31658) - L. 6.6 mm OD, c.145 mm TL. **B3.** PEM 13025 (SAM 31656) - R. 8.1 mm OD, 187 mm TL. **C.** *Electrona antarctica* SSF 86.44. **C1.** PEM 10227 (SAM 31192) - L. 2.05 mm OD, 74 mm TL. **C2.** PEM 10220 - R. 2.25 mm OD, 85 mm TL. **C3.** PEM 10225 (SAM 31192) - L. 2.4 mm OD, 83 mm TL. **D.** *E. carlsbergi* SSF 86.45. **D1.** PEM 7662 - R. 3.3 mm OD, 70 mm SL. **D2.** PEM 7665 - R. 3.3 mm OD, 72 mm SL. **D3.** PEM 7677 - R. 3.5 mm OD, 79 mm SL. **E.** *E. risso* SSF 86.47. **E1.** PEM 13128 - L. 2.7 mm OD, 38 mm TL. **E2.** PEM 13184 - L. 3.6 mm OD, 54 mm TL. **E3.** PEM 13370 - L. 4.4 mm OD. **F.** *Gonichthys barnesi* SSF 86.49. **F1.** PEM 1779 - R. 1.26 mm OD, 40 mm SL. **F2.** PEM 3461 - R. 1.44 mm OD, c.43 mm SL. Scale bars 1 mm (—) or 0.1 mm (⌈).



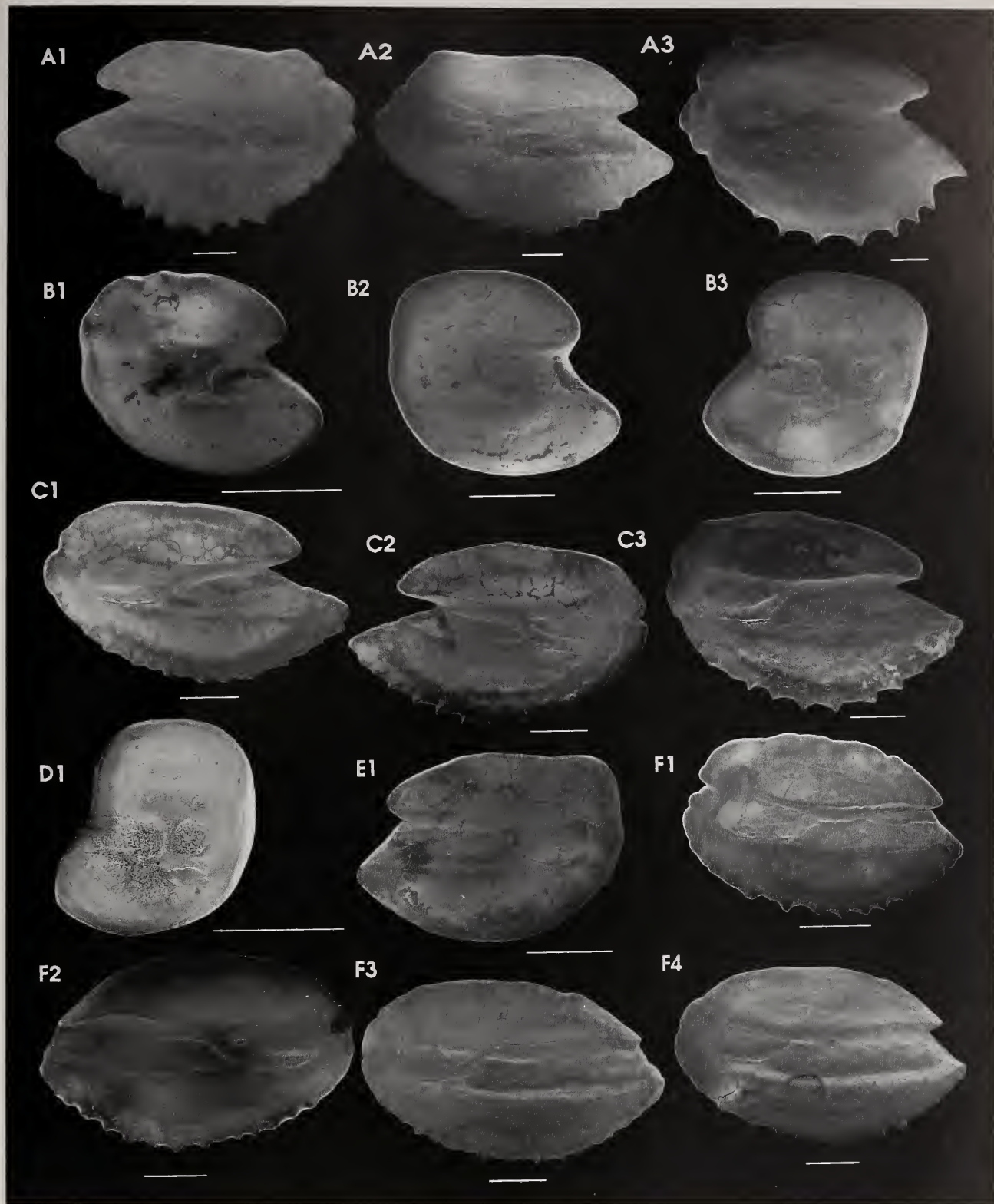


Plate 20. MYCTOPHIDAE 166 ctd. A. *Gymnoscopelus bolini* SSF 86.51. A1. PEM 13087 (SAM 32153) - R. 7.3 mm OD, 255 mm TL. A2. PEM 13374 (SAM 32157) - L. 7.9 mm OD, 203 mm SL. A3. PEM 13144 (SAM 32152) - L. 8.5 mm OD, 298 mm TL. B. *G. braueri* SSF 86.52. B1. PEM 7545 - L. 2.4 mm OD, 86 mm SL. B2. PEM 10253 - L. 2.95 mm OD, 136 mm TL. B3. PEM 7544 - R. 3.0 mm OD, 126 mm SL. C. *G. nicholsi* SSF 86.53. C1. PEM 10255 - L. 5.5 mm OD, 164 mm TL. C2. PEM 7628 - R. 5.6 mm OD, 137 mm SL. C3. PEM 7611 - L. 5.9 mm OD, 145 mm SL. D. *G. opisthopterus* SSF 86.54. D1. PEM 11833 - R. 1.4 mm OD, 100 mm SL. E. *G. fraseri* SSF 86.55. E1. PEM 7546 - R. 3.3 mm OD, 66 mm SL. F. *G. piabilis* SSF 86.58. F1. PEM 13377 - L. 4.3 mm OD, 100 mm TL. F2. PEM 13631 - R. 5.4 mm OD, 120 mm TL. F3. PEM 13645 - L. 5.8 mm OD, 134 mm TL. F4. PEM 13110 (SAM 31925) - L. 6.0 mm OD, 117 mm SL. Scale bars 1 mm (—).

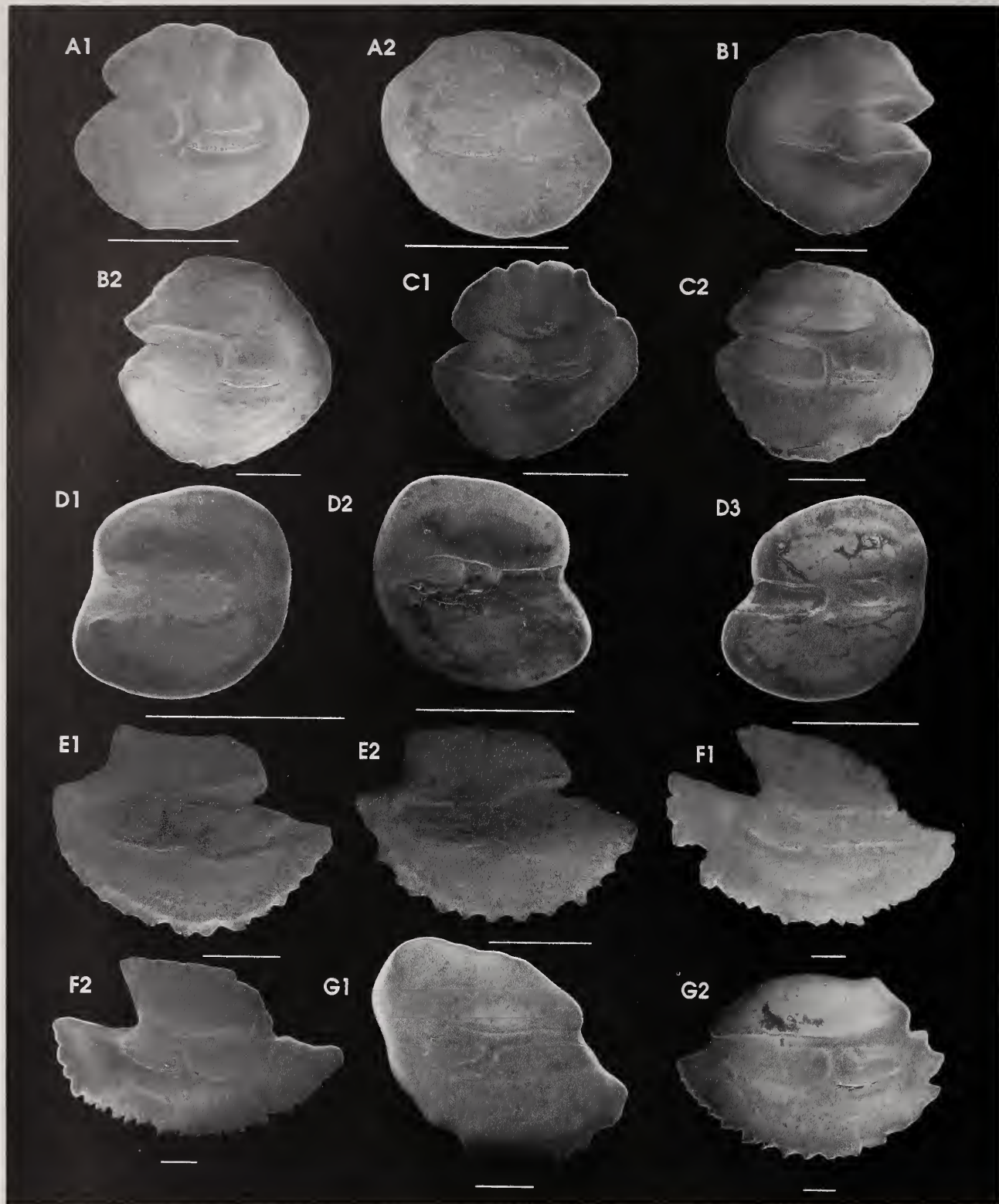


Plate 21. MYCTOPHIDAE 166 ctd. A. *Hygophum hanseni* SSF 86.60. A1. PEM 1776 - R. 2.0 mm OD, 38 mm SL. A2. PEM 1775 - L. 1.4 mm OD, 29 mm SL. B. *H. hygonii* SSF 86.61. B1. PEM 13384 (SAM 31809) - L. 3.0 mm OD, 65 mm TL. B2. PEM 3437 - R. 3.42 mm OD, c.58 mm SL. C. *H. proximum* SSF 86.62. C1. PEM 0928 - R. 1.9 mm OD. C2. PEM 0928 - R. 2.9 mm OD. D. *Krefflichthys anderssoni* SSF 86.64. D1. PEM 7646 - R. 1.3 mm OD, 38 mm SL. D2. PEM 10247 - L. 1.6 mm OD, 64 mm TL. D3. PEM 7655 - R. 1.9 mm OD, 66 mm SL. E. *Lampadena chavesi* SSF 86.66. E1. PEM 7989 - L. 3.7 mm OD, 66 mm SL. E2. 0264H - L. 3.8 mm OD, 67 mm SL. F. *L. luminosa* SSF 86.68. F1. PEM 13242 (SAM 32178) - L. 8.6 mm OD, 172 mm TL. F2. PEM 13241 (SAM 32178) - L. 8.5 mm OD, 181 mm TL. G. *L. notialis* SSF 86.69. G1. PEM 13147 - L. 5.0 mm OD, 159 mm TL. G2. PEM 13146 - R. 8.7 mm OD, 166 mm TL. Scale bars 1 mm (—).



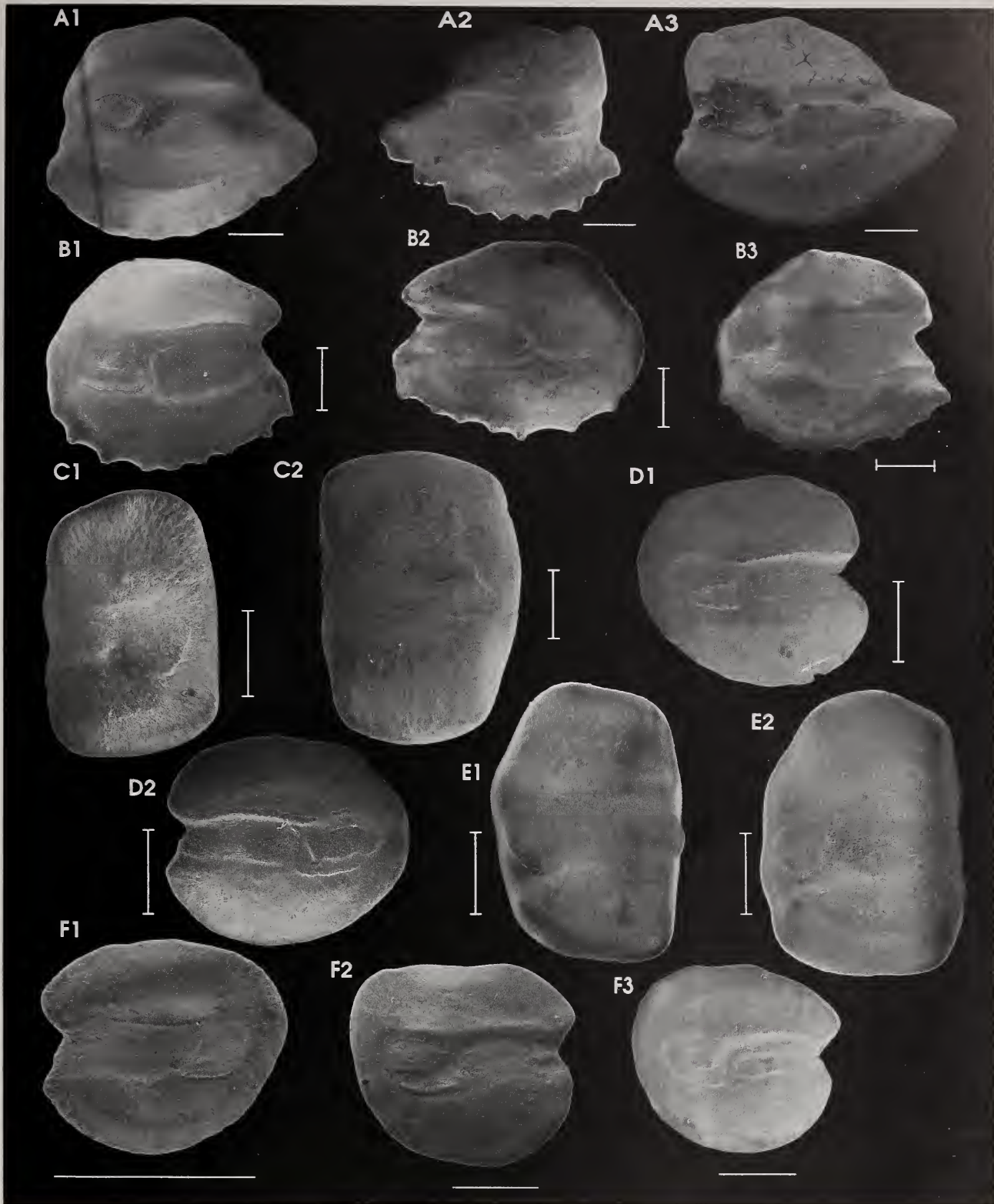


Plate 22. MYCTOPHIDAE 166 ctd. A. *Lampadena speculigera* SSF 86.71. A1. PEM 13134 - L. 4.8 mm OD, 159 mm TL. A2. PEM 7562 - R. 5.0 mm OD, 117 mm SL. A3. PEM 7831 - L. 5.8 mm OD, 151 mm SL. B. *Lampanyctodes hectoris* SSF 86.72. B1. PEM 7477 - L. 2.1 mm OD, 59 mm TL. B2. PEM 7536 - R. 2.2 mm OD, 62 mm SL. B3. PEM 7532 - L. 2.3 mm OD, 64 mm SL. C. *Lampanyctus achirus* SSF 86.73. C1. PEM 3436 (SAM 28666) - R. 1.0 mm OD, c.115 mm SL. C2. PEM 3455 (SAM 28669) - L. 1.3 mm OD, c.144 mm SL. D. *L. alatus* SSF 86.74. D1. PEM 3393 (SAM 28679) - L. 2.15 mm OD, c.50 mm SL. D2. PEM 3395 (SAM 28689) - R. 2.32 mm OD, c.55 mm SL. E. *L. ater* SSF 86.75. E1. PEM 13231 (SAM 32073) - L. 1.8 mm OD, 99 mm SL. E2. PEM 13255 (SAM 32074) - L. 1.9 mm OD, 124 mm TL. F. *L. australis* SSF 86.76. F1. PEM 1748 (SAM 28326) - R. 1.32 mm OD, 43 mm SL. F2. PEM 13263 (SAM 32059) - L. 2.8 mm OD, 122 mm TL. F3. PEM 3483 (SAM 28650) - L. 2.82 mm OD, c.92 mm SL. Scale bars 1 mm (—) or 0.5 mm (⊥).

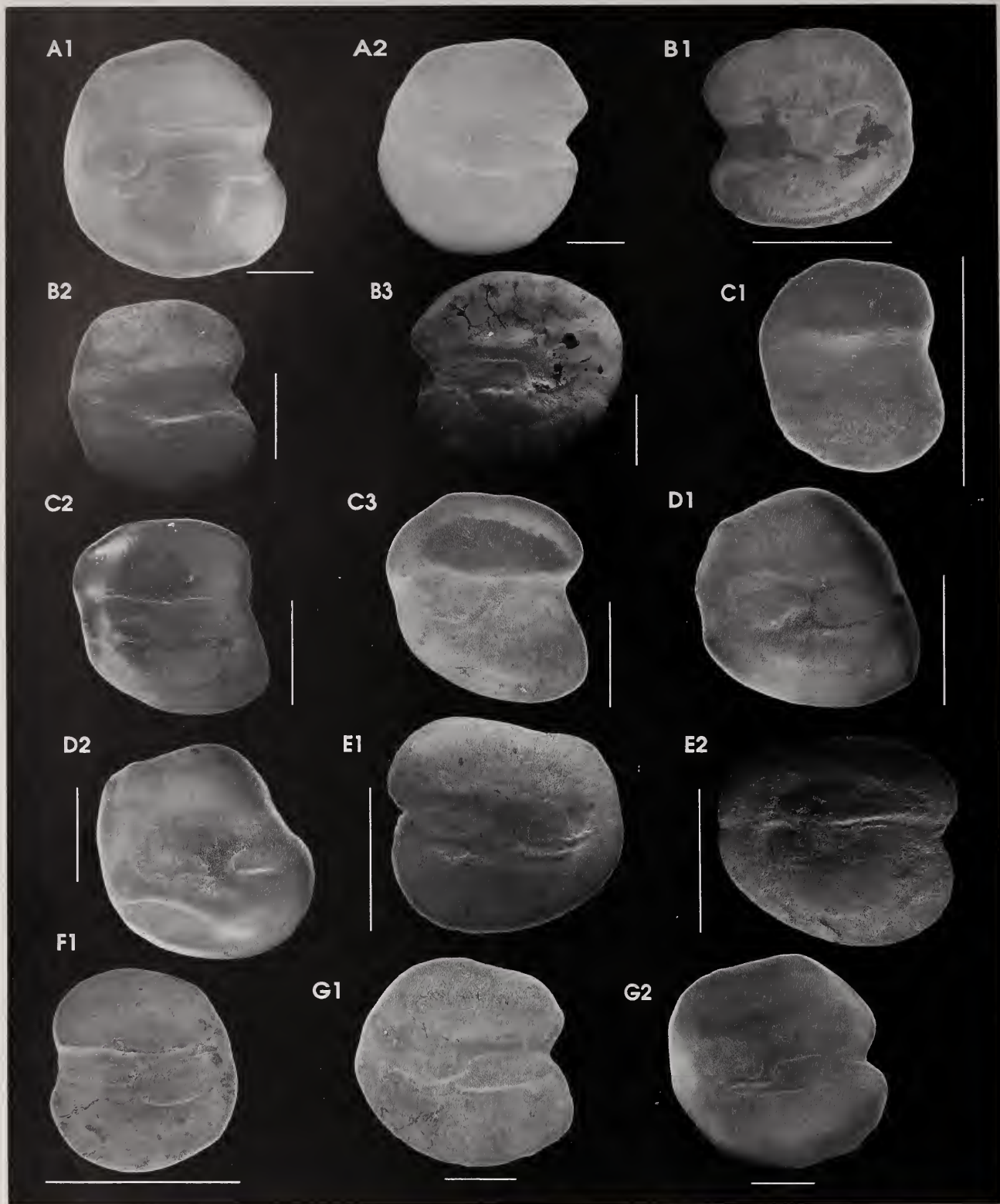
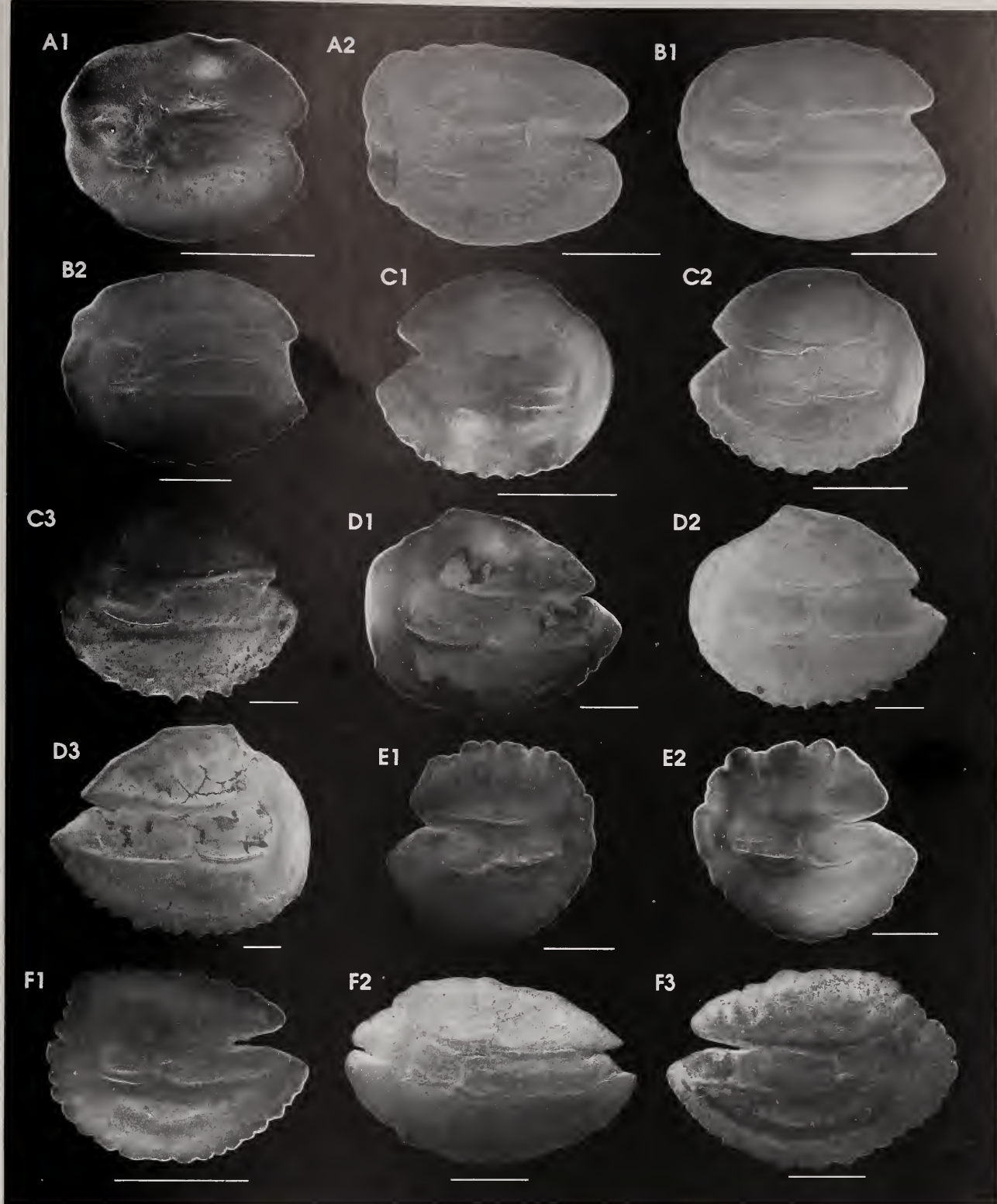


Plate 23. MYCTOPHIDAE 166 ctd. A. *Lampanyctus festivus* SSF 86.77. A1. PEM 13376 - L. 3.5 mm OD, 224 mm TL. A2. PEM 13250 - L. 3.7 mm OD, 156 mm TL. B. *L. intricarius* SSF 86.78. B1. PEM 7984 - R. 1.6 mm OD, 99 mm SL. B2. PEM 13343 (SAM 31950) - L. 2.3 mm OD, 134 mm SL. B3. PEM 7825 - R. 3.2 mm OD, 156 mm SL. C. *L. lepidolichnus* SSF 86.79. C1. PEM 1745 (SAM 28327) - R. 0.9 mm OD, 37 mm SL. C2. PEM 3394 (SAM 28654) - L. 2.2 mm OD, c.98 mm SL. C3. PEM 13211 (SAM 31915) - L. 2.4 mm OD, 111 mm TL. D. *L. macdonaldi* SSF 86.81. D1. PEM 13221 (SAM 31841) - L. 2.0 mm OD, 98 mm SL. D2. PEM 13224 (SAM 31841) - L. 2.5 mm OD, 139 mm TL. E. *L. photonotus* SSF 86.83. E1. 1333H - R. 1.65 mm OD, 65 mm TL. E2. 1334H - L. 1.75 mm OD, 60 mm TL. F. *L. pusillus* SSF 86.84. F1. PEM 7980 (SAM 29264) - R. 1.3 mm OD, 33 mm SL. G. *L. tenuiformis* SSF 86.86. G1. PEM 13254 - L. 3.1 mm OD, 142 mm TL. G2. PEM 13342 - L. 3.5 mm OD, 186 mm TL. Scale bars 1 mm (—).





**Plate 24. MYCTOPHIDAE** 166 ctd. **A.** *Lampanyctus vadulus* SSF 86.-. **A1.** PEM 13252 (SAM 31947) - L. 2.1 mm OD, 107 mm TL. **A2.** PEM 13378 (SAM 31948) - L. 2.9 mm OD, 119 mm TL. **B.** *Lampichthys procerus* SSF 86.90. **B1.** PEM 13228 (SAM 32002) - L. 3.3 mm OD, 96 mm TL. **B2.** PEM 13225 (SAM 32002) - L. 3.6 mm OD, 107 mm TL. **C.** *Lobianchia dofleini* SSF 86.92. **C1.** PEM 7548 - R. 2.3 mm OD, 31 mm SL. **C2.** PEM 1771 (SAM 28357) - R. 2.66 mm OD, 31 mm SL. **C3.** PEM 7841 - L. 5.3 mm OD, 62 mm SL. **D.** *L. gemellarii* SSF 86.93. **D1.** PEM 7991 (SAM 29287) - L. 4.9 mm OD, 55 mm SL. **D2.** PEM 7986 (SAM 29287) - R. 5.5 mm OD, 63 mm SL. **D3.** PEM 7835 (SAM 29472) - R. 7.4 mm OD, 96 mm SL. **E.** *Metelectrona ventralis* SSF 86.97. **E1.** PEM 13917 - R. 3.1 mm OD, 63 mm SL. **E2.** PEM 13911 - L. 3.6 mm OD, 92 mm TL. **F.** *Myctophum aurolaternatum* SSF 86.99. **F1.** PEM 0918b - L. 2.1 mm OD. **F2.** 0866H - L. 3.9 mm OD. **F3.** PEM 0918a - R. 3.9 mm OD. Scale bars 1 mm (—).

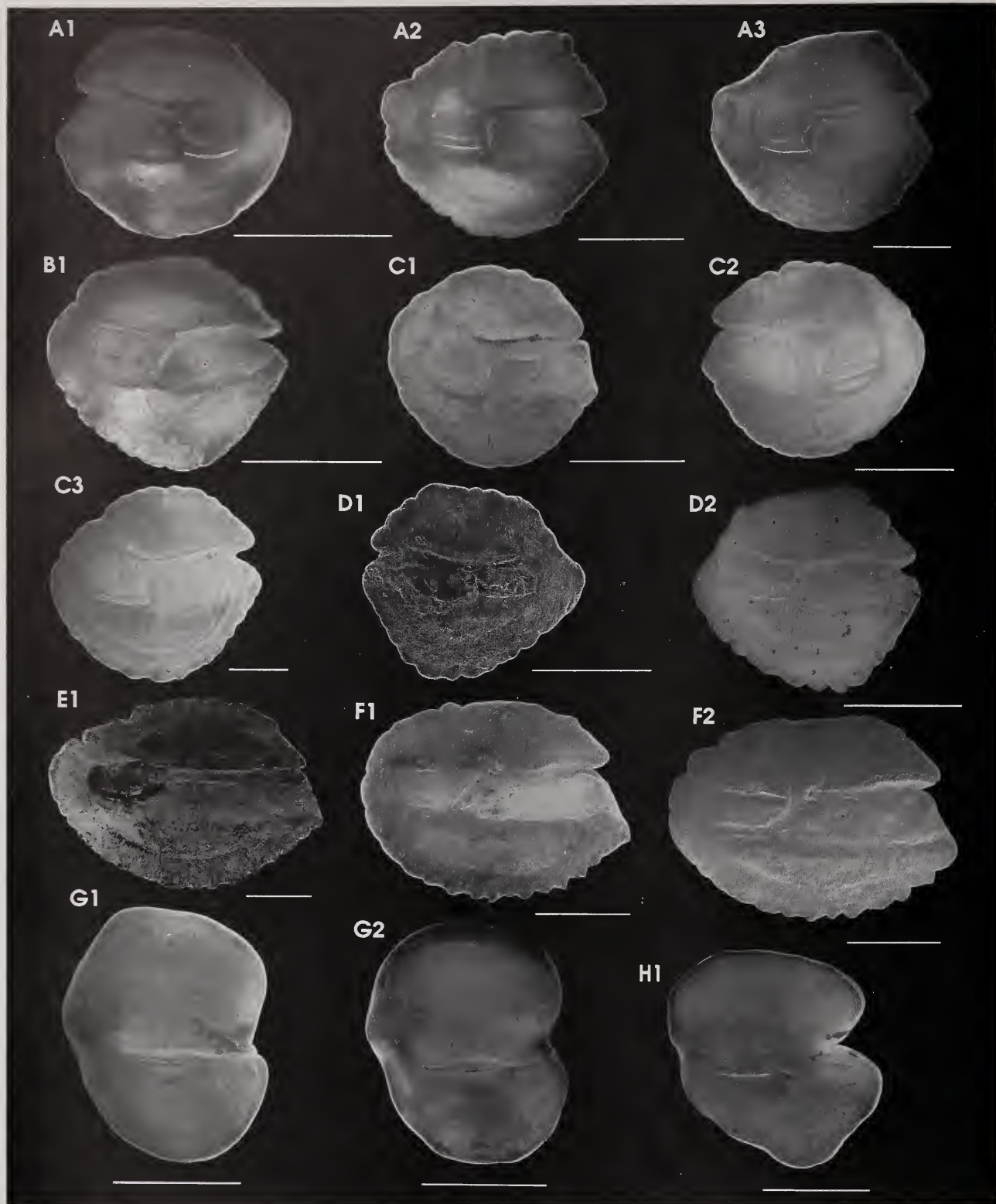


Plate 25. MYCTOPHIDAE 166 ctd. A. *Myctophum nitidulum* SSF 86.101. A1. PEM 0518c - R. 1.6 mm OD, 35 mm SL. A2. PEM 3469 - L. 2.2 mm OD, c.54 mm SL. A3. PEM 0518a - L. 2.9 mm OD, 69 mm SL. B. *M. obtusirostre* SSF 86.102. B1. PEM 1783 (SAM 28310) - L. 1.8 mm OD, 378 mm SL. C. *M. phengodes* SSF 86.103. C1. PEM 1780 (SAM 28305) - L. 2.01 mm OD, 39 mm SL. C2. PEM 3388 (SAM 28682) - R. 2.44 mm OD, c.46 mm SL. C3. PEM 13290 (SAM 32042) - L. 3.6 mm OD, 91 mm TL. D. *M. spinosum* SSF 86.105. D1. PEM 3413 (SAM 28688) - R. 2.03 mm OD, c.54 mm SL. D2. PEM 3464 (SAM 28670) - L. 2.09 mm OD, c.58 mm SL. E. *Notoscopelus caudispinosus* SSF 86.107. E1. PEM 8000 (SAM 29245) - L. 4.3 mm OD. F. *N. resplendens* SSF 86.108. F1. PEM 13287 (SAM 32107) - L. 3.0 mm OD, 77 mm SL. F2. PEM 13229 (SAM 32105) - L. 3.1 mm OD, 87 mm TL. G. *Protomyctophum bolini* SSF 86.112. G1. PEM 10258 - L. 2.1 mm OD, 43 mm SL. G2. PEM 10257 - L. 2.1 mm OD, 43 mm SL. H. *P. normani* SSF 86.116. H1. PEM 7604 (SAM 30839) - L. 2.3 mm OD, 70 mm SL. Scale bars 1 mm (—).



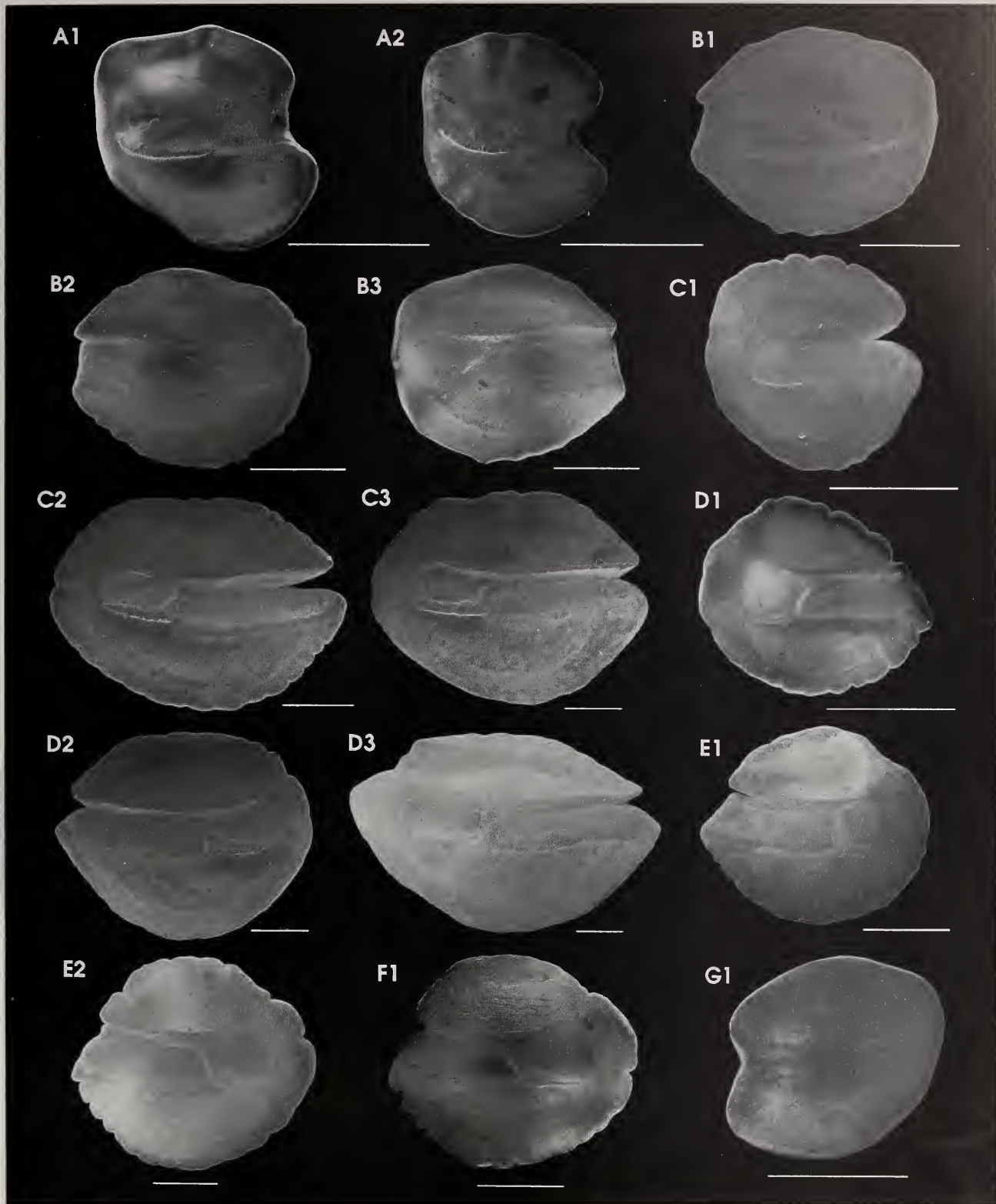


Plate 26. MYCTOPHIDAE 166 ctd. A. *Protomyctophum tenisoni* SSF 86.117. A1. PEM 7600 - L. 1.8 mm OD, 49 mm SL. A2. PEM 7603 - L. 1.5 mm OD, 40 mm SL. B. *Scopelopsis multipunctatus* SSF 86.118. B1. PEM 3545 (SAM 29114) - R. 2.6 mm OD, c.53 mm SL. B2. PEM 3495 (SAM 28664) - R. 2.63 mm OD, c.55 mm SL. B3. PEM 3466 - L. 3.0 mm OD, c.61 mm SL. C. *Symbolophorus barnardi* SSF 86.119. C1. PEM 13469 - L. 1.9 mm OD, 53 mm TL. C2. PEM 13453 (SAM 31962) - L. 4.3 mm OD, 105 mm TL. C3. PEM 13975 - L. 5.0 mm OD, 121 mm TL. D. *S. boops* SSF 86.120. D1. PEM 1787 - L. 2.59 mm OD, 50 mm SL. D2. PEM 13982 (SAM 32014) - R. 4.9 mm OD, 118 mm TL. D3. PEM 13903 (SAM 32011) - L. 6.0 mm OD, 144 mm TL. E. *S. evermanni* SSF 86.121. E1. 0834H - R. 2.75 mm OD. E2. PEM 0522 - R. 3.95 mm OD. F. *S. rufinus* SSF 86.122. F1. 0842H - R. 2.95 mm OD. G. *Taaningichthys bathyphilus* SSF 86.123. G1. PEM 3489 (SAM 28677) - R. 1.71 mm OD, 50 mm SL. Scale bars 1 mm (—).

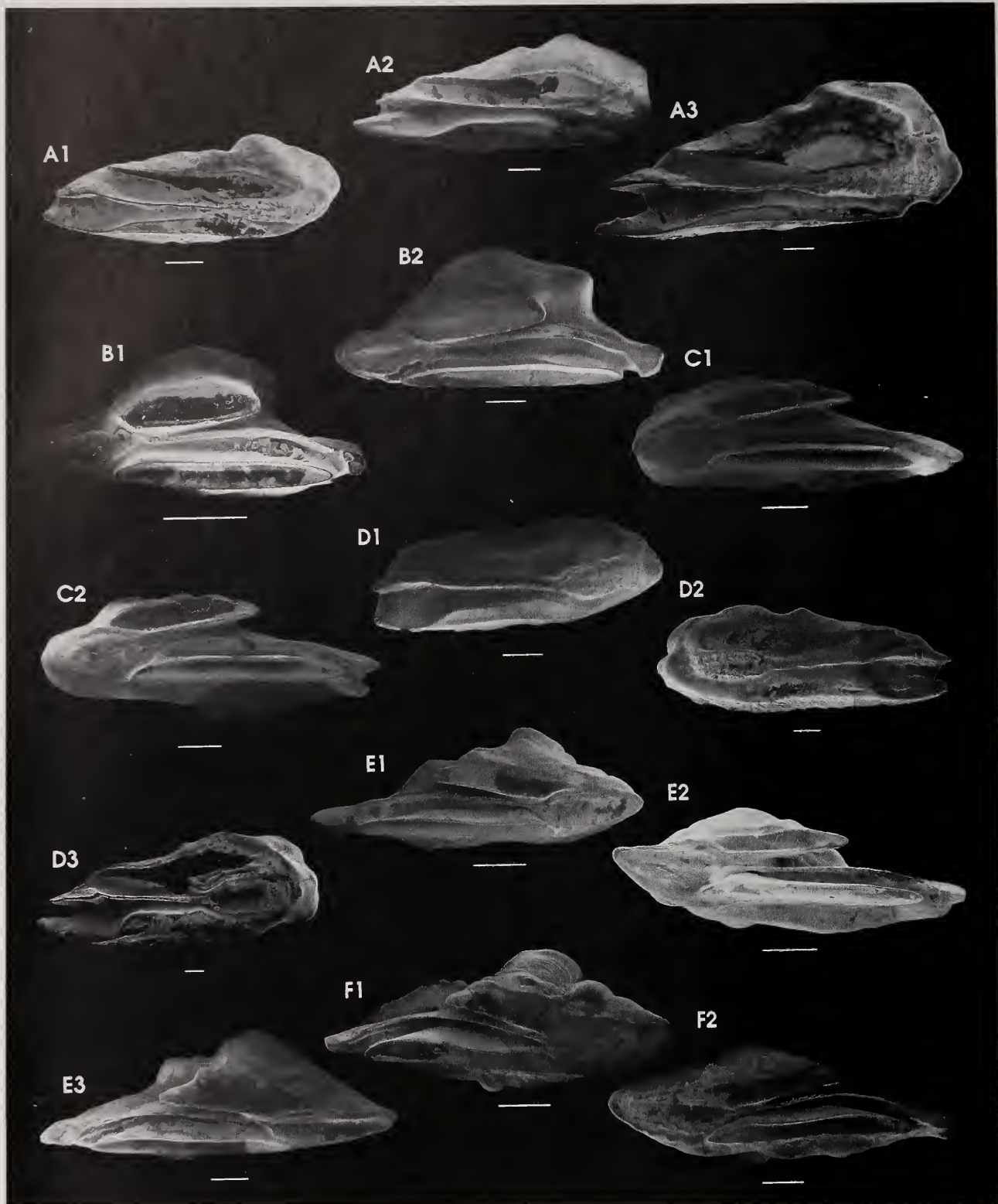


Plate 27. MORIDAE 171. A. *Antimora rostrata* SSF 90.1. A1. PEM 14518 (RUSI 31377) - R. 8.4 mm OD, 173 mm TL. A2. PEM 12256 - R. 10.3 mm OD, 227 mm SL. A3. PEM 13406 - R. 13.3 mm OD, 405 mm TL. B. *Laemonema globiceps* SSF 90.3. B1. PEM 13790 - R. 7.9 mm OD, 165 mm TL. B2. PEM 12283 - R. 9.4 mm OD, 165 mm SL. C. *L. laureysi* SSF 90.4. C1. PEM 14451 (RUSI 31381) - R. 6.0 mm OD, 176 mm TL. C2. PEM 14452 (RUSI 31396) - R. 8.6 mm OD, 209 mm TL. D. *Lepidion capensis* SSF 90.5. D1. PEM 13403 - L. 8.2 mm OD, 160 mm TL. D2. PEM 13734 - R. 11.6 mm OD, 275 mm TL. D3. PEM 13563 - L. 15.9 mm OD, 435 mm TL. E. *Physiculus capensis* SSF 90.7. E1. PEM 14446 (RUSI 28366) - L. 6.5 mm OD, 120 mm TL. E2. PEM 12467 (RUSI 28317) - R. 7.5 mm OD, 121 mm TL. E3. PEM 14442 (RUSI 34136) - L. 10.3 mm OD, 200 mm TL. F. *P. natalensis* SSF 90.8. F1. PEM 5094 - L. 7.24 mm OD, 145 mm TL. F2. PEM 5093 - R. 9.13 mm OD, 220 mm TL. Scale bars 1 mm (—).



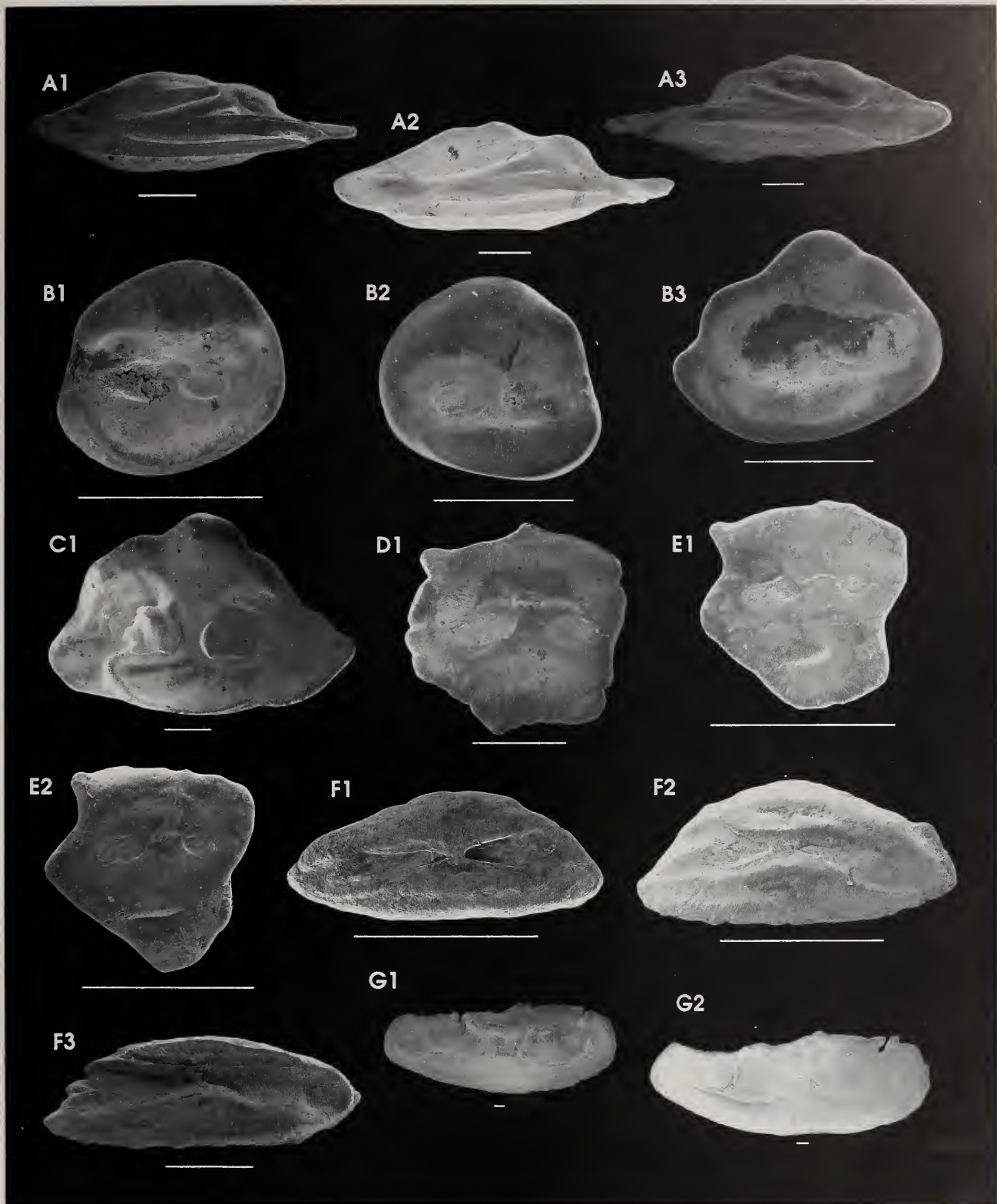


Plate 28. MORIDAE 171 ctd. A. *Tripterophycis gilchristi* SSF 90.9. A1. PEM 11284 - R. 5.5 mm OD, 110 mm TL. A2. PEM 14154 (RUSI 28318) - R. 7.3 mm OD, 177 mm TL. A3. PEM 12706 (RUSI 34071) - L. 8.3 mm OD, 221 mm TL. MELANONIDAE 172. B. *Melanonus gracilis* SSF 91.1. B1. PEM 1733 (SAM 28407) - 1.3 mm OD, 42 mm SL. B2. PEM 3389 (SAM 28739) - 1.5 mm OD, c.65 mm SL. B3. PEM 3450 (SAM 28736) - 2.1 mm OD, c.75 mm SL. C. *M. zugmayeri* SSF 91.2. C1. PEM 13373 - 7.0 mm OD, 261 mm TL. BREGMACEROTIDAE 173. D. *Bregmaceros macclellandii* SSF 92.2. D1. PEM 3458 - 2.45 mm OD, c.65 mm SL. E. *B. nectabanus* SSF 92.3. E1. PEM 12784 (RUSI 28313) - 1.2 mm OD, 48 mm TL. E2. PEM 12782 (RUSI 28311) - 1.3 mm OD, 47 mm TL. GADIDAE 174. F. *Gaidropsarus capensis* SSF 88.1. F1. PEM 5602 - 1.7 mm OD, 61 mm TL. F2. PEM 5206 (RUSI 13834) - 2.1 mm OD, 90 mm TL. F3. PEM 5578 - 3.7 mm OD, 194 mm TL. MERLUCCIIDAE 175. G. *Macruronus capensis* SSF 89.3. G1. 1336H - 25.3 mm OD, 1070 mm TL. G2. PEM 14218 - 26.3 mm OD. Scale bars 1 mm (—).

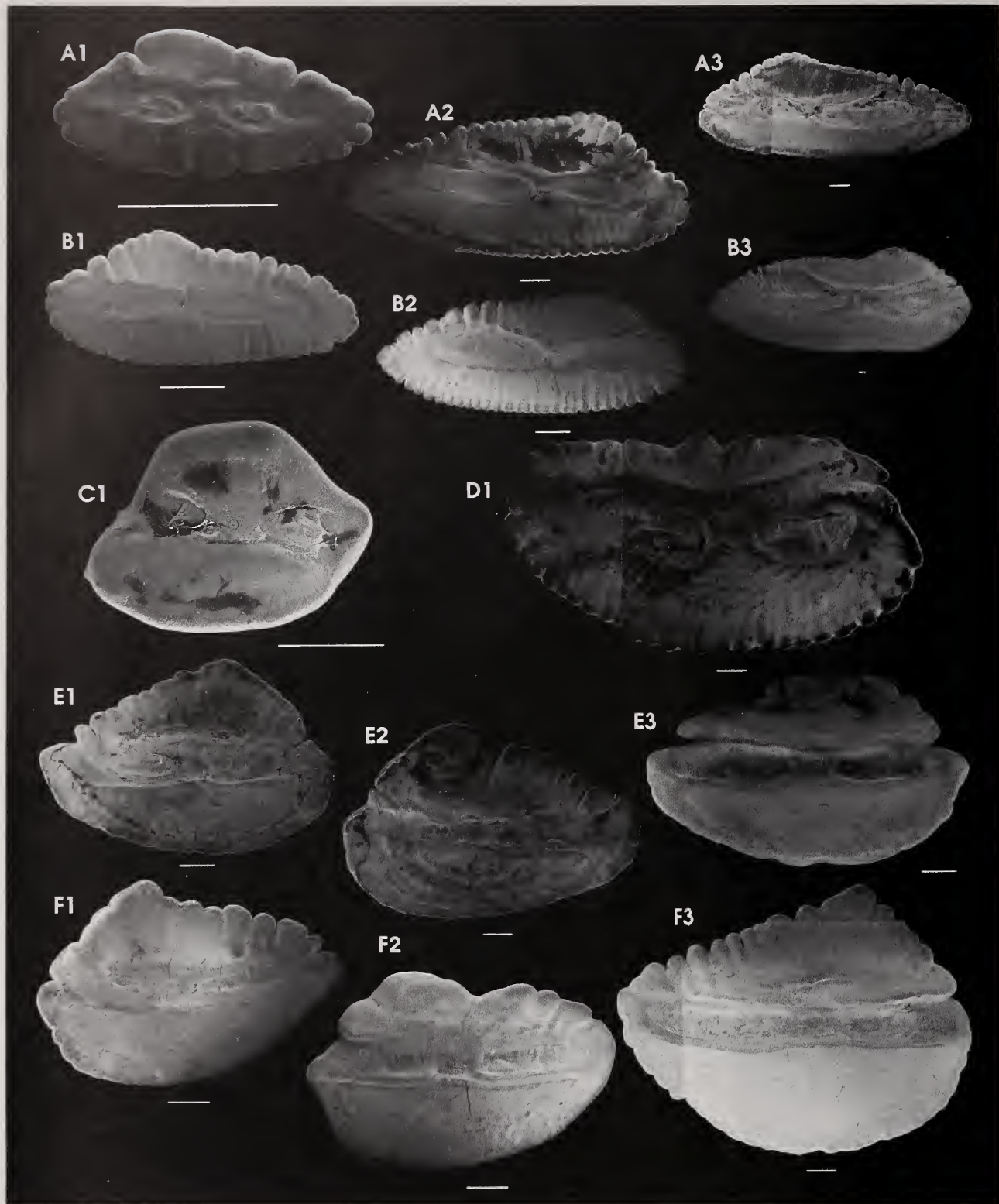


Plate 29. MERLUCCIIDAE 175 ctd. A. *Merluccius capensis* SSF 89.4. A1. PEM 7347 - L. 2.3 mm OD, 49 mm TL. A2. PEM 7798 (RUSI 28314) - R. 12.4 mm OD, 282 mm TL. A3. PEM 7802 - R. 14.6 mm OD, 337 mm TL. B. *M. paradoxus* SSF 89.5. B1. PEM 10639 - L. 9.23 mm OD, 210 mm TL. B2. PEM 10611 - R. 11.82 mm OD, 267 mm TL. B3. PEM 10614 - R. 26.5 mm OD, 720 mm TL. MACROURIDAE 176. C. *Bathygadus cottoides* SSF 93.-. C1. PEM 15351 (RUSI 38212) - R. 2.7 mm OD, 177 mm TL. D. *B. melanobranchus* SSF 93.2. D1. PEM 13440 - R. 15.3 mm OD, 770 mm TL. E. *Caelorinchus acanthiger* SSF 93.4. E1. PEM 14504 (RUSI 31406) - R. 8.5 mm OD, 233 mm TL. E2. PEM 14505 (RUSI 31390) - R. 9.5 mm OD, 267 mm TL. E3. PEM 14687 - R. 12.2 mm OD, 402 mm TL. F. *C. braueri* SSF 93.5. F1. PEM 13811 (RUSI 28304) - R. 8.1 mm OD, 218 mm TL. F2. PEM 13720 - R. 11.2 mm OD, 325 mm TL. F3. PEM 14936 - L. 13.4 mm OD, 400 mm TL. Scale bars 1 mm (—).



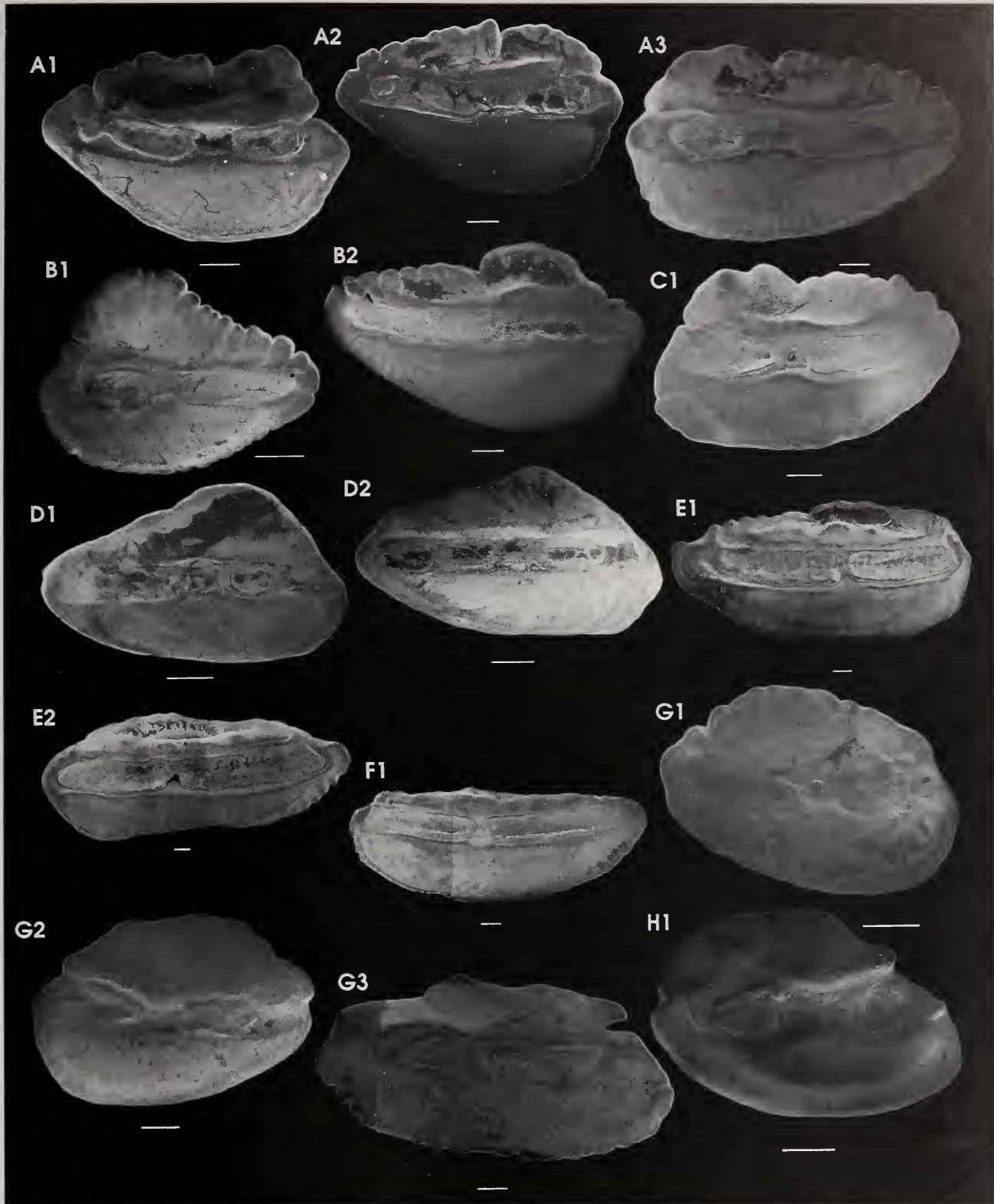


Plate 30. MACROURIDAE 176 ctd. A. *Caelorinchus simorhynchus* SSF 93.8. A1. PEM 8120 (RUSI 34163) - L. 8.2 mm OD, 206 mm TL. A2. PEM 8119 (RUSI 34163) - L. 10.2 mm OD, 275 mm TL. A3. PEM 11387 - R. 12.4 mm OD, 366 mm TL. B. *C. denticulatus* SSF 93.7. B1. PEM 11359 (RUSI 28302) - R. 6.0 mm OD, 141 mm TL. B2. PEM 12869 (RUSI 28303) - L. 10.8 mm OD, 211 mm TL. C. *C. kaiyomaru* SSF 93.-. C1. PEM 14900 (RUSI 35585) - R. 9.6 mm OD, 321 mm TL. D. *C. karrerae* SSF 93.-. D1. PEM 14468 (RUSI 31391) - L. 6.9 mm OD, 239 mm TL. D2. PEM 14497 (RUSI 31395) - L. 7.5 mm OD, 246 mm TL. E. *C. quadricristatus* SSF 93.-. E1. PEM 5074 - 16.96 mm OD, 460 mm TL. E2. 1579H - 21.18 mm OD, 260 mm SL. F. *C. trunovi* SSF 93.9. F1. PEM 13042 - 16.4 mm OD, 428 mm TL. G. *Coryphaenoides striaturus* SSF 93.12. G1. PEM 14465 (RUSI 31384) - L. 5.8 mm OD, 230 mm TL. G2. PEM 14463 (RUSI 31427) - R. 8.3 mm OD, 380 mm TL. G3. PEM 15369 - 13.18 mm OD, 560 mm TL. H. *C. subserrulatus* SSF 93.13. H1. PEM 14510 (RUSI 31423) - L. 6.3 mm OD, 352 mm TL. Scale bars 1 mm (—).

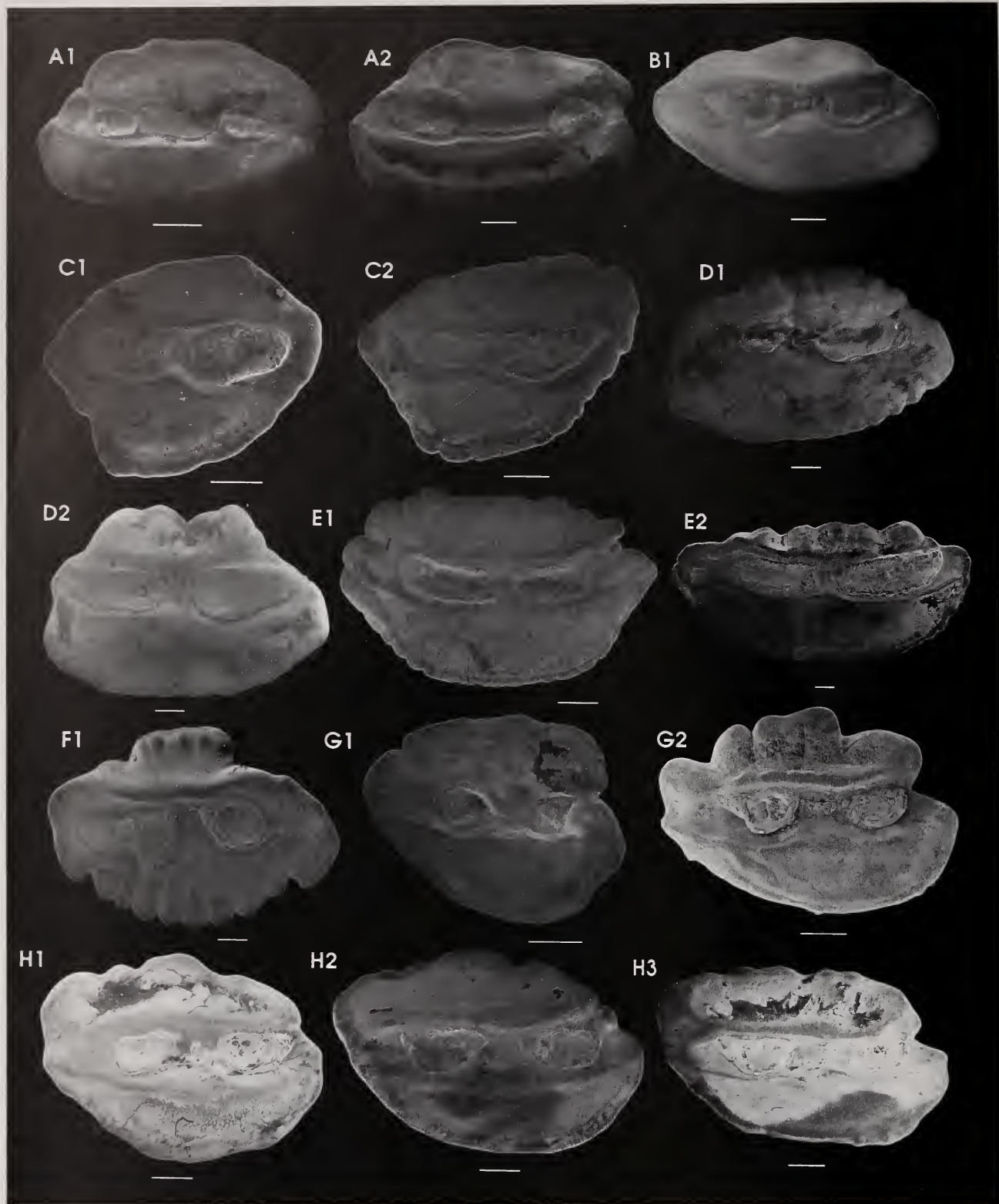


Plate 31. MACROURIDAE 176 ctd. A. *Gadomus capensis* SSF 93.14. A1. PEM 13765 - L. 6.3 mm OD, 322 mm TL. A2. PEM 13769 - L. 8.6 mm OD, 420 mm TL. B. *Kuronezumia leonis* SSF 93.21. B1. PEM 14899 - L. 9.1 mm OD, 389 mm PAL. C. *Lucigadus ori* SSF 93.32. C1. PEM 8122 (RUSI 40679) - L. 5.9 mm OD, 182 mm TL. C2. PEM 14121 (RUSI 28301) - L. 6.6 mm OD, 217 mm TL. D. *Caelorinchus matamua* SSF 93.16. D1. PEM 13817 (RUSI 28299) - R. 10.4 mm OD, 362 mm TL. D2. PEM 13816 (RUSI 28298) - R. 10.9 mm OD, 483 mm TL. E. *Malacocephalus laevis* SSF 93.17. E1. PEM 12716 (RUSI 28307) - 8.7 mm OD, c.283 mm TL. E2. PEM 14135 - 16.3 mm OD, 650 mm TL. F. *Mesobius antipodum* SSF 93.18. F1. PEM 13318 - L. 10.5 mm OD, 460 mm TL. G. *Nezumia brevibarbata* SSF 93.19. G1. PEM 14517 (RUSI 31444) - L. 5.3 mm OD, 183 mm TL. G2. PEM 14464 (RUSI 31455) - L. 7.1 mm OD, 260 mm TL. H. *N. micronychodon* SSF 93.22. H1. PEM 14467 (RUSI 31453) - L. 8.0 mm OD, 74 mm TL. H2. PEM 14516 (RUSI 31452) - L. 8.4 mm OD, 260 mm TL. H3. PEM 14515 (RUSI 31419) - L. 8.7 mm OD, 282 mm TL. Scale bars 1 mm (—).



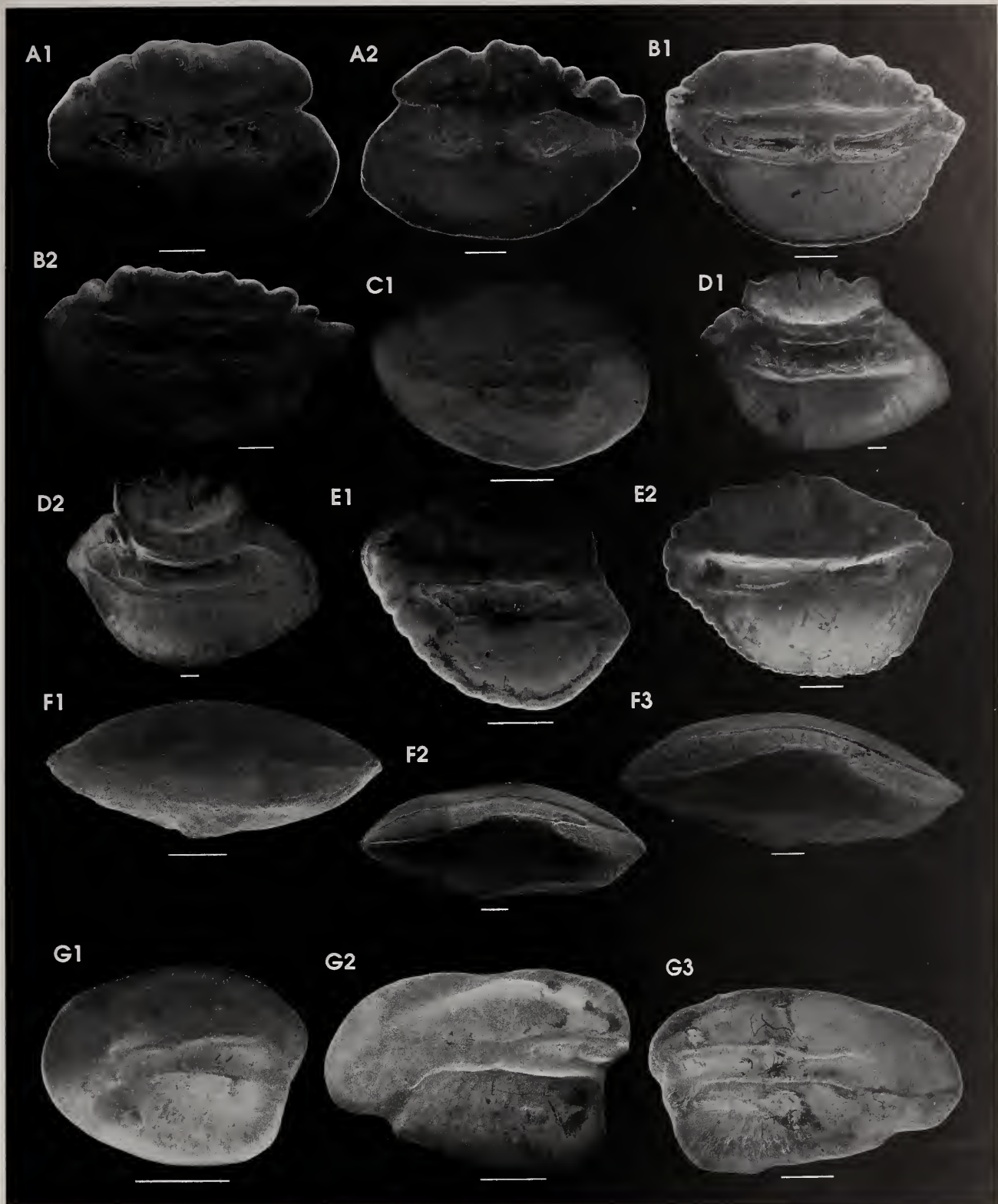


Plate 32. MACROURIDAE 176 ctd. A. *Nezumia umbracincta* SSF 93.-. A1. PEM 13805 - L. 6.9 mm OD, 290 mm TL. A2. PEM 13802 - R. 7.9 mm OD, 310 mm TL. B. *Sphagemacrus pumiliceps* SSF 93.27. B1. PEM 0417 - L. 7.7 mm OD, 160 mm TL. B2. 0182H - L. 9.76 mm OD, c.160 mm TL. C. *Trachonurus villosus* SSF 93.28. C1. PEM 13413 - R. 4.7 mm OD, 256 mm TL. D. *Trachyrincus scabrus* SSF 93.29. D1. PEM 14764 - L. 14.0 mm OD, 337 mm TL. D2. PEM 14763 - L. 14.9 mm OD, 432 mm TL. E. *Ventrifossa nasuta* SSF 93.31. E1. PEM 14749 - L. 4.5 mm OD, 138 mm TL. E2. PEM 12714 (RUSI 28509) - L. 7.7 mm OD, 171 mm TL. OPHIDIIDAE 177. F. *Brotula multibarbata* SSF 96.3. F1. PEM 15591 - L. 6.14 mm OD, 130 mm TL. F2. 1402H - L. 11.06 mm OD, 237 mm TL. F3. PEM 14247 (RUSI 34566) - L. 11.7 mm OD, 287 mm TL. G. *Dicrolene intronigra* SSF 96.5. G1. PEM 13660 - L. 3.1 mm OD, 161 mm TL. G2. PEM 13654 - L. 5.3 mm OD, 288 mm TL. G3. PEM 14461 (RUSI 31415) - R. 6.4 mm OD, 260 mm TL. Scale bars 1 mm (—).

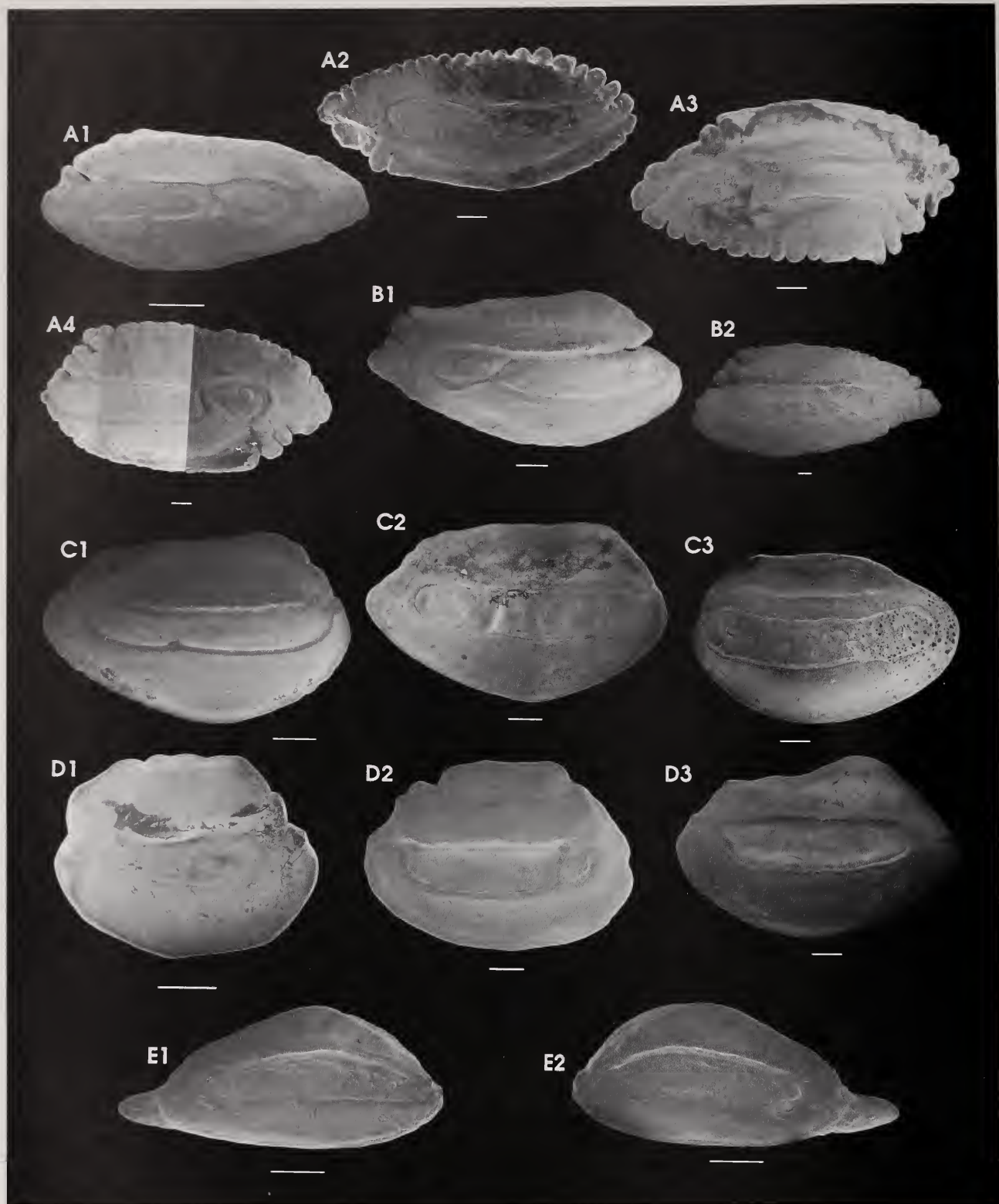


Plate 33. OPHIDIIDAE 177 ctd. A. *Genypterus capensis* SSF 96.9. A1. PEM 12036 - R. 6.3 mm OD, 205 mm TL. A2. PEM 9013 (RUSI 37519) - L. 11.2 mm OD, 403 mm TL. A3. PEM 11349 - R. 12.5 mm OD, 525 mm TL. A4. PEM 15157 - R. 15.8 mm OD, 790 mm TL. B. *Hoplobrotula gnathopus* SSF 96.13. B1. PEM 15009 (RUSI 35571) - L. 11.5 mm OD, 246 mm TL. B2. PEM 14976 (RUSI 35543) - R. 19.9 mm OD, 521 mm TL. C. *Neobythites analis* SSF 93.18. C1. PEM 13032 (RUSI 28319) - L. 7.6 mm OD, 155 mm TL. C2. PEM 15154 - L. 9.94 mm OD, 188 mm SL. C3. 1571H - R. 10.54 mm OD, 186 mm SL. D. *Selachophidium guentheri* SSF 96.22. D1. PEM 12062 - L. 4.6 mm OD, 156 mm TL. D2. PEM 14902 (RUSI 35574) - R. 8.9 mm OD, 270 mm TL. D3. PEM 14059 - R. 10.4 mm OD, 284 mm TL. CARAPIDAE 178. E. *Encheliophis boraborensis* 97.-. E1. PEM 15473 (RUSI 40594) - L. 6.2 mm OD, 258 mm TL. E2. PEM 15473 - R. Scale bars 1 mm (—).



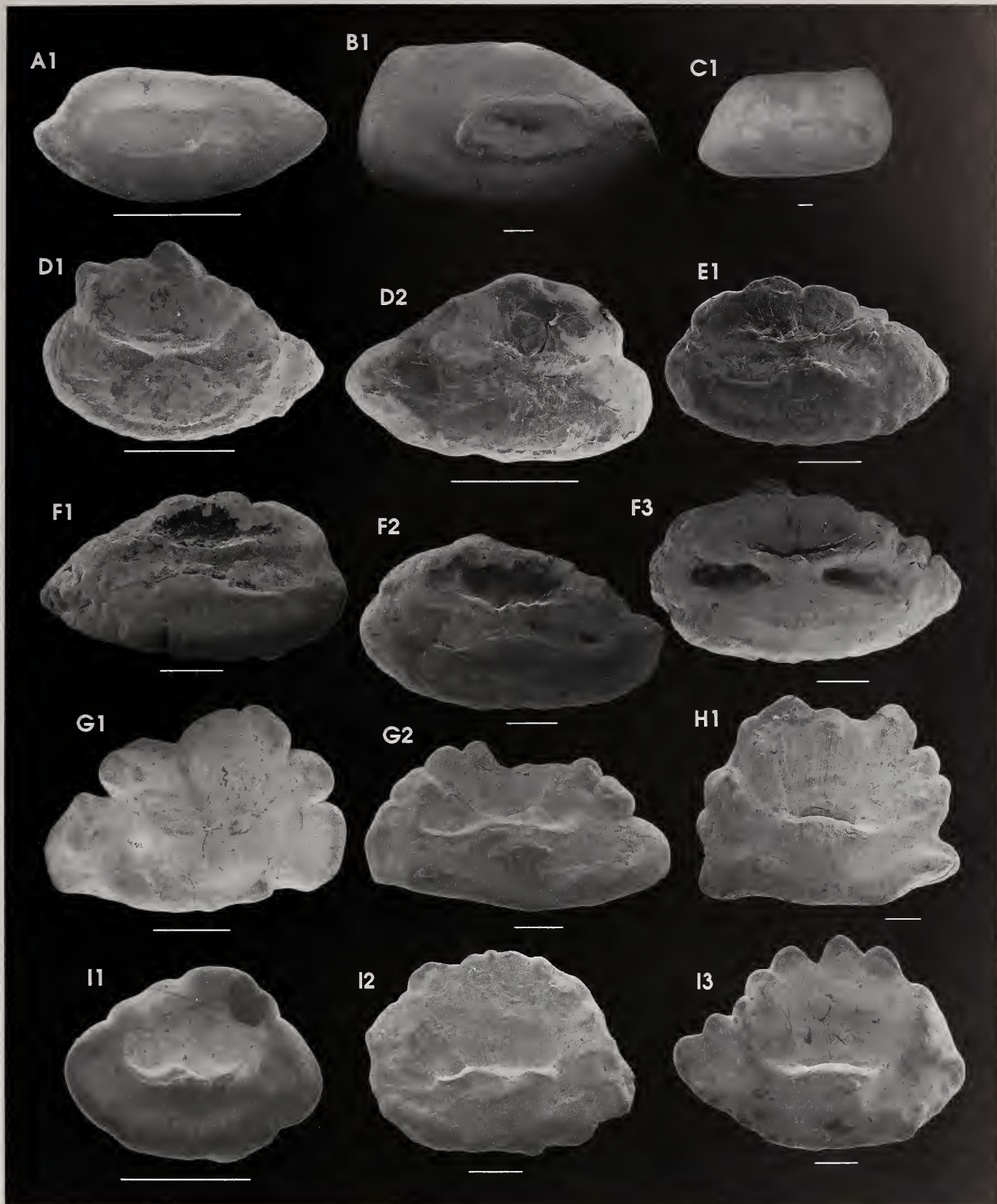


Plate 34. BYTHITIDAE 179. A. *Bidenichthys capensis* SSF 98.1. A1. PEM 5600 - R. 2.4 mm OD, 60 mm TL. B. *Cataetx laticeps* SSF 98.3. B1. PEM 13316 - L. 10.8 mm OD, 540 mm TL. C. *C. niki* SSF 98.4. C1. PEM 14589 - L. 14.7 mm OD, 583 mm TL. BATRACHOIDIDAE 181. D. *Batrachthys apiatius* SSF 100.3. D1. PEM 14824 - L. 2.6 mm OD, 70 mm TL. D2. PEM 9981 - L. 2.8 mm OD, 71 mm TL. E. *Chatrabus hendersoni* SSF 100.5. E1. PEM 11329 (RUSI 28295) - R. 5.0 mm OD, 122 mm TL. F. *C. melanurus* SSF 100.6. F1. PEM 12545 (RUSI 28296) - L. 5.4 mm OD, 126 mm TL. F2. PEM 14400 (RUSI 34145) - R. 6.6 mm OD, 180 mm TL. F3. PEM 14882 (RUSI 35579) - R. 11.6 mm OD, 187 mm TL. LOPHIIDAE 182. G. *Lophiodes mutilus* SSF 101.2. G1. PEM 0434 - R. 4.15 mm OD, 160 mm TL. G2. PEM 0435 - R. 7.14 mm OD, 245 mm TL. H. *Lophius vaillanti* SSF 101.-. H1. PEM 15063 - 7.9 mm OD. I. *L. vomerinus* SSF 101.4. I1. PEM 14139 (RUSI 28297) - 2.2 mm OD, 96 mm TL. I2. PEM 11717 - 5.6 mm OD, 363 mm TL. I3. PEM 11719 - 7.1 mm OD, 500 mm TL. Scale bars 1 mm (—).

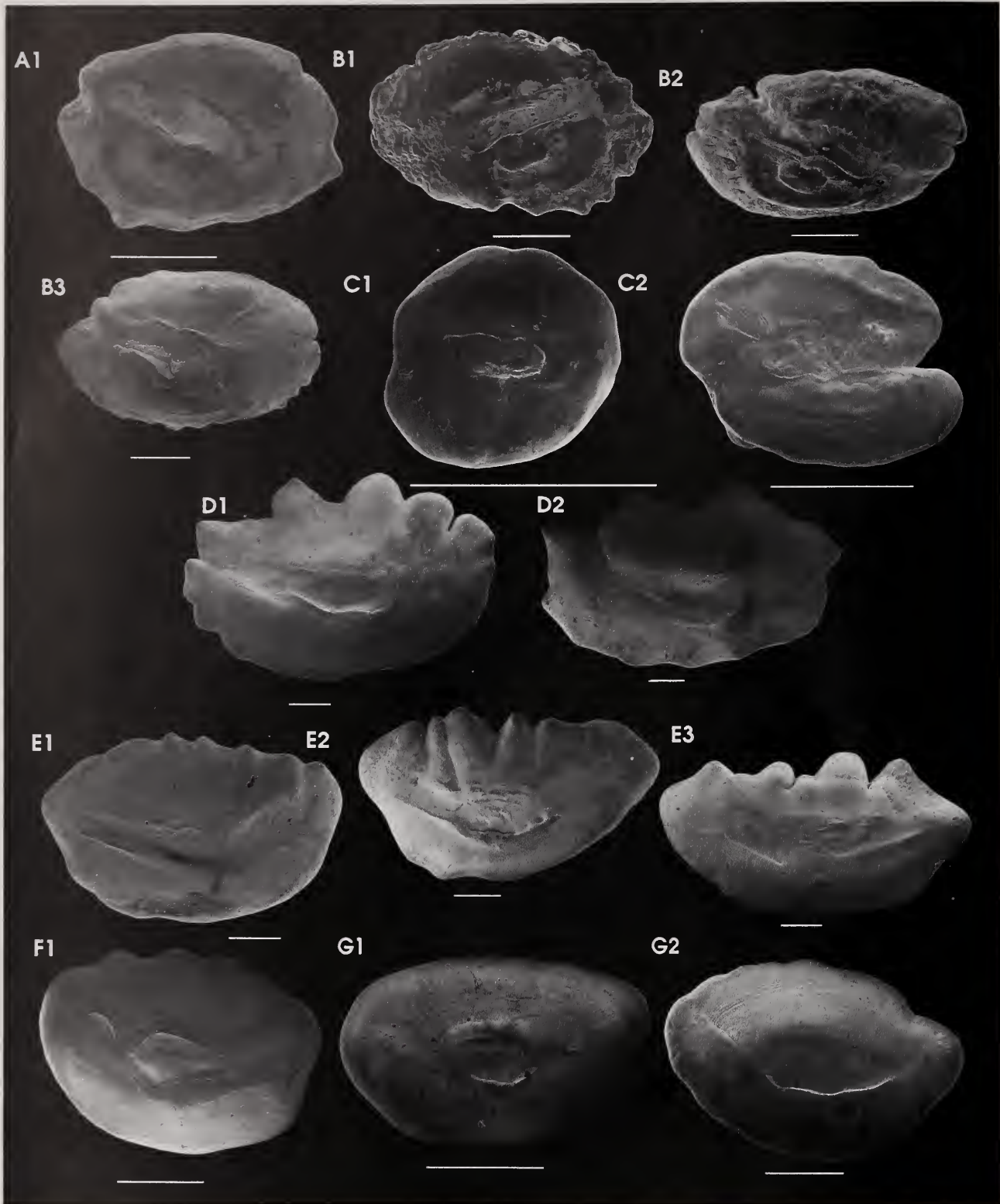


Plate 35. ANTENNARIIDAE 183. A. *Antennarius hispidus* SSF 102.4. A1. PEM 0228 - R. 2.8 mm OD, 50 mm TL. B. *A. striatus* SSF 102.7. B1. PEM 0299 (RUSI 4555) - L. 4.05 mm OD, 115 mm TL. B2. PEM 14840 (RUSI 37089) - R. 4.5 mm OD, 119 mm TL. B3. PEM 14841 (RUSI 37089) - R. 5.0 mm OD, 142 mm TL. C. *Histrio histrio* SSF 102.9. C1. PEM 0792 - R. 1.1 mm OD. C2. PEM 9654 - L. 2.2 mm OD, 200 mm TL. CHAUNACIDAE 185. D. *Chaunax pictus* SSF 103.2. D1. PEM 12955 - R. 8.6 mm OD, 212 mm TL. D2. PEM 12954 (RUSI 34164) - R. 9.6 mm OD, 260 mm TL. OGCOCEPHALIDAE 186. E. *Halieutaea fitzsimonsi* SSF 104.2. E1. PEM 12840 - R. 6.4 mm OD. E2. PEM 12844 - R. 6.6 mm OD, 130 mm TL. E3. PEM 12969 (RUSI 28309) - L. 7.8 mm OD, 180 mm TL. F. *Malthopsis luteus* SSF 104.6. F1. PEM 12965 - R. 3.7 mm OD, 92 mm TL. G. *M. tiarella* SSF 104.8. G1. PEM 13068 (RUSI 28477) - R. 2.9 mm OD, 65 mm TL. G2. PEM 13024 (RUSI 28477) - L. 4.0 mm OD, 196 mm TL. Scale bars 1 mm (—).



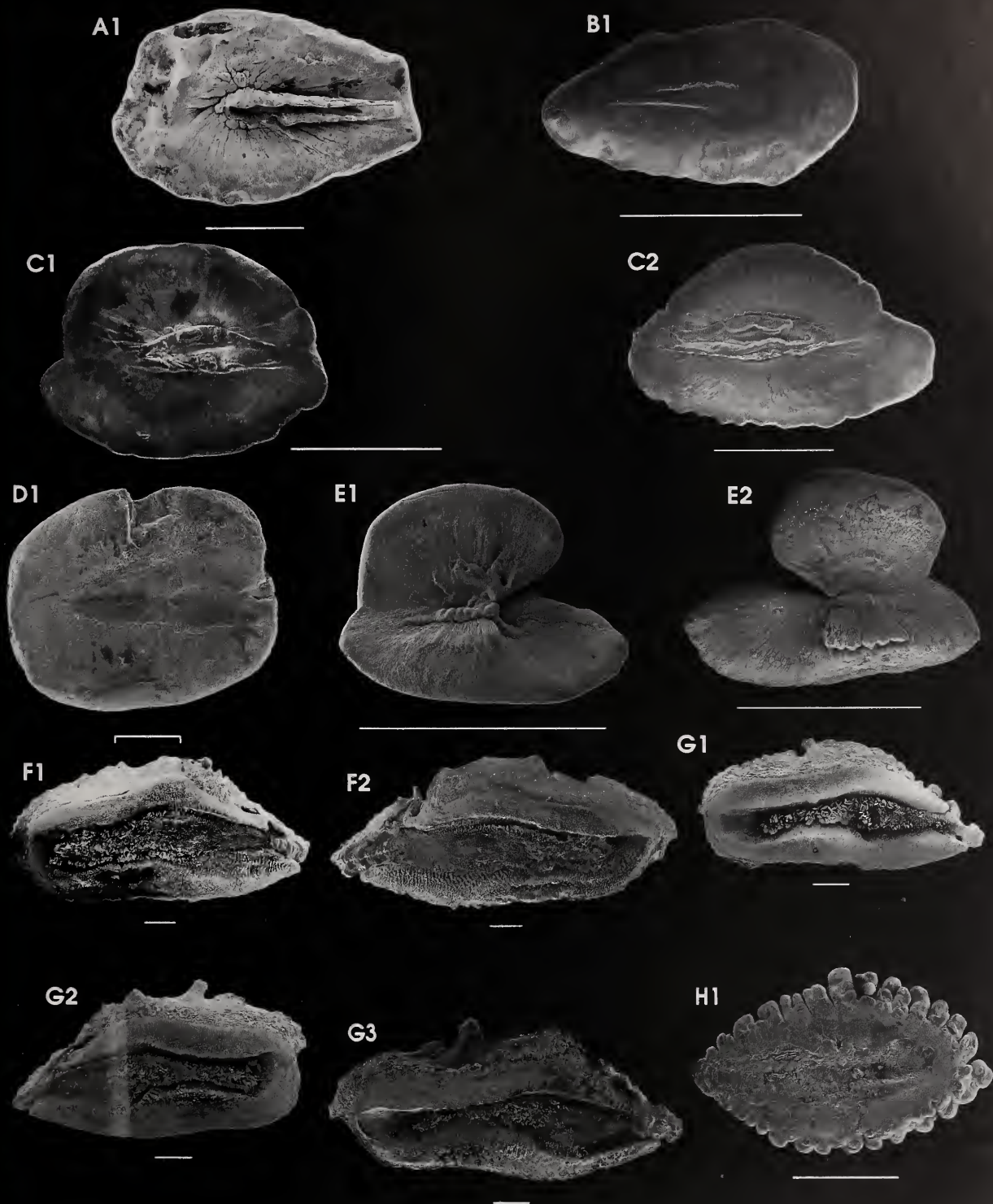


Plate 36. CERATIIDAE 188. A. *Ceratias tentaculatus* SSF 105.2. A1. PEM 15354 (RUSI 38217) - L. 3.25 mm OD, 310 mm TL. B. *Cryptosaras couesii* SSF 105.3. B1. PEM 13175 (SAM 31588) - R. 1.9 mm OD, 65 mm TL. HIMANTOLOPHIDAE 196. C. *Himantolophus groenlandicus* SSF 108.1. C1. PEM 12130 - R. 1.95 mm OD. C2. PEM 13142 (SAM 31615) - L. 2.7 mm OD, 234 mm TL. GOBIESOCIDAE 198. D. *Apletodon pellegrini* SSF 110.1. D1. PEM 6066 (RUSI 17130) - L. 0.5 mm OD, 28 mm TL. E. *Chorisochismus dentex* SSF 110.2. E1. PEM 10377 - L. 1.3 mm OD, 123 mm TL. E2. PEM 10474 - R. 1.6 mm OD, 235 mm TL. EXOCOETIDAE 200. F. *Cheilopogon cyanopterus* SSF 116.1. F1. PEM 15339 - L. c.10.4 mm OD, 270 mm SL. F2. PEM 14275 - R. 10.6 mm OD, 275 mm SL. G. *C. pinnatibarbatus altipennis* SSF 116.4. G1. PEM 1606 - L. 8.54 mm OD, 374 mm TL. G2. PEM 8340 - R. 8.9 mm OD, 365 mm TL. G3. 1389H - L. 10.0 mm OD, 320 mm SL. H. *Cypselurus oligolepis* SSF 116.-. H1. PEM 15395 (RUSI 40558) - R. 2.85 mm OD, 77 mm TL. Scale bars 1 mm (—) or 0.1 mm (—).



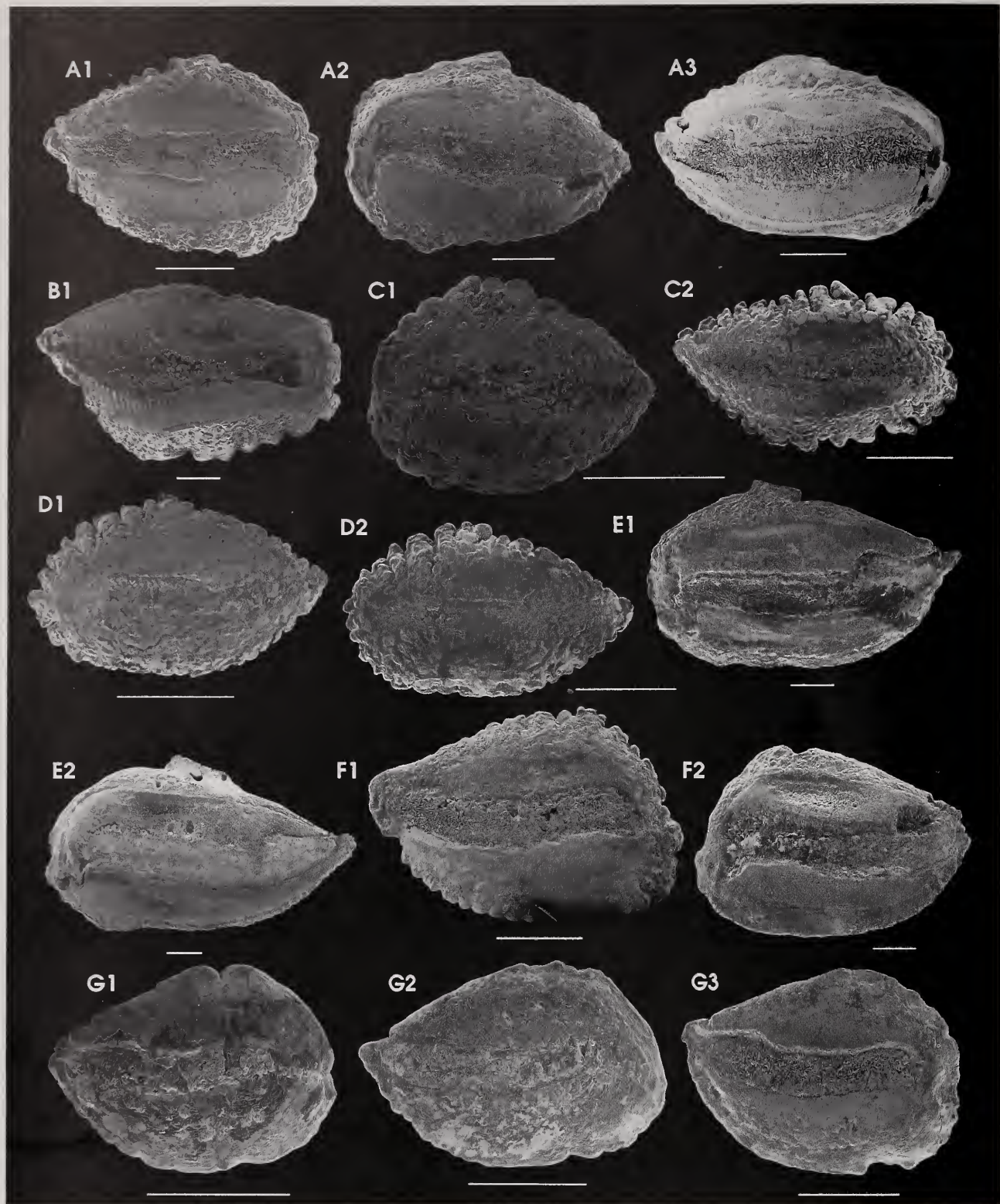


Plate 37. EXCOETIDAE 200 ctd. A. *Exocoetus volitans* SSF 116.6. A1. PEM 8169 - R. 3.8 mm OD, 127 mm TL. A2. PEM 8165 - L. 4.5 mm OD, 150 mm TL. A3. PEM 8166 (RUSI 28521) - R. 4.9 mm OD, 144 mm TL. B. *Hirundichthys rondeletii* SSF 116.7. B1. PEM 6488 - R. 7.6 mm OD, 200 mm SL. C. *Parexocoetus mento* SSF 116.10. C1. PEM 3386 - L. 2.12 mm OD, c.55 mm SL. C2. PEM 0034 - R. 3.3 mm OD. HEMIRAMPIIIDAE 201. D. *Euleptorhamphus viridis* SSF 115.1. D1. PEM 8170 - L. 2.8 mm OD, 101 mm TL. D2. PEM 8226 - L. 2.95 mm OD, 105 mm TL. E. *Hemiramphus far* SSF 115.2. E1. PEM 6724 - L. 7.4 mm OD, 323 mm SL. E2. PEM 4865 - L. 9.6 mm OD, 500 mm TL. F. *Hyporhamphus affinis* SSF 115.3. F1. PEM 8227 - R. 3.75 mm OD, 199 mm TL. F2. PEM 2709 (RUSI 9509) - L. 7.26 mm OD, 358 mm TL. G. *H. capensis* SSF 115.4. G1. PEM 5935 - R. 2.1 mm OD, 121 mm TL. G2. PEM 4321 (RUSI 13233) - R. 2.85 mm OD, 156 mm TL. G3. PEM 1387 - R. 3.08 mm OD, 165 mm TL. Scale bars 1 mm (—).



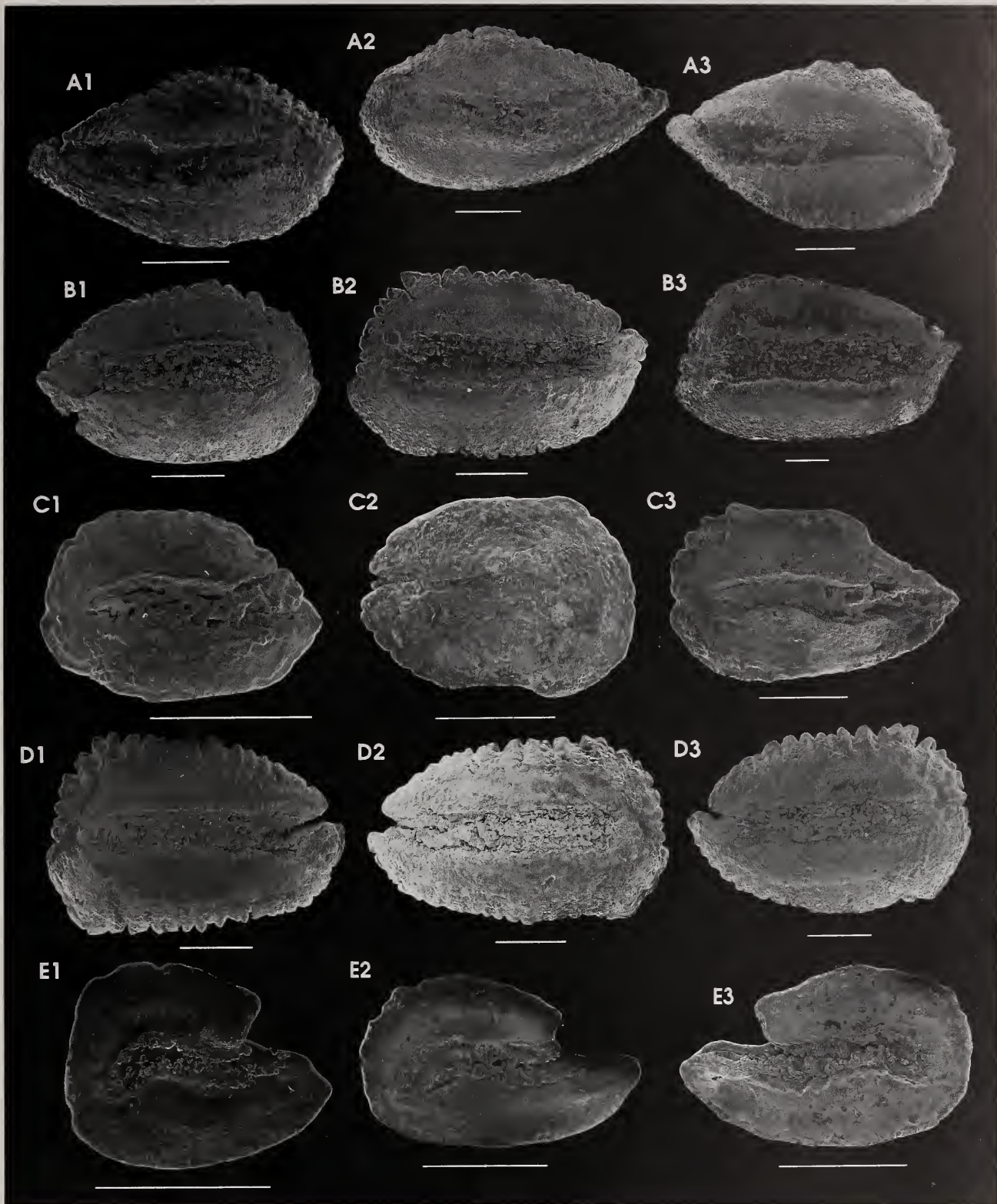


Plate 38. HEMIRAMPHIDAE 201 ctd. A. *Oxyporhamphus micropterus micropterus* SSF 115.6. A1. PEM 0529 - R. 3.75 mm OD, 97 mm SL. A2. PEM 0529 - L. 4.85 mm OD, 118 mm SL. A3. PEM 0529 - R. 5.38 mm OD, 132 mm SL. BELONIDAE 202. B. *Ablennes hians* SSF 113.1. B1. PEM 4885 - R. 4.1 mm OD, 546 mm TL. B2. PEM 5926 - L. 4.3 mm OD, 663 mm FL. B3. PEM 6508 - L. 7.0 mm OD, 1171 mm TL. C. *Petalichthys capensis* SSF 113.2. C1. PEM 0759 - L. 1.85 mm OD, 224 mm TL. C2. PEM 2095 - R. 2.64 mm OD. C3. PEM 2094 - L. 3.64 mm OD, 350 mm TL. D. *Tylosurus crocodilus crocodilus* SSF 113.4. D1. PEM 12819 (RUSI 28320) - L. 4.4 mm OD, 453 mm TL. D2. PEM 15329 (RUSI 36881) - R. 4.5 mm OD, 462 mm TL. D3. PEM 8410 - R. 4.8 mm OD, 450 mm TL. SCOMBERESOCIDAE 203. E. *Scomberesox saurus scomberoides* SSF 114.2. E1. PEM 13960 - L. 1.7 mm OD, 265 mm TL. E2. PEM 10864 - L. 2.3 mm OD. E3. PEM 12879 (RUSI 28321) - R. 2.4 mm OD, 321 mm TL. Scale bars 1 mm (—).



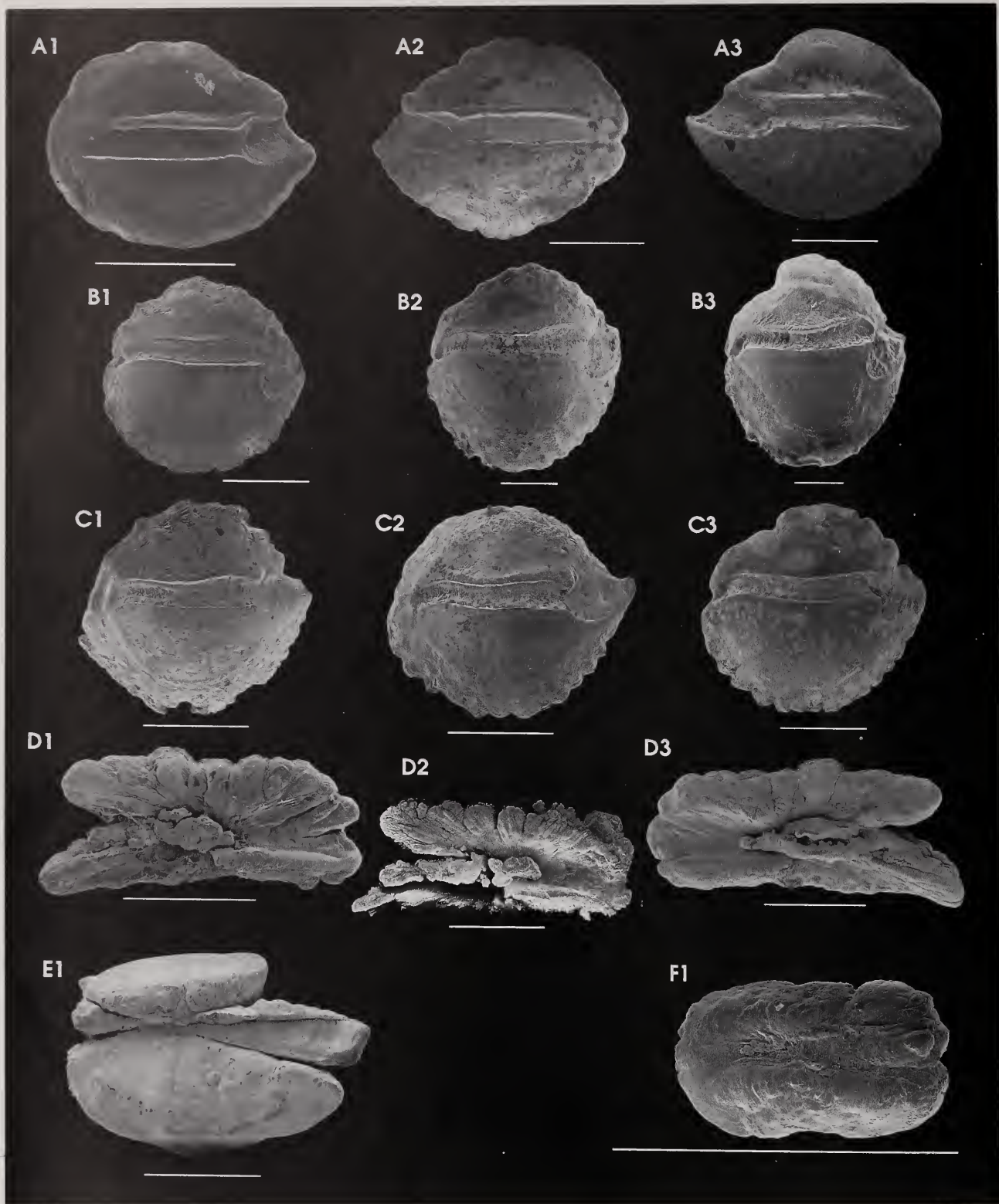


Plate 39. ATHERINIDAE 213. A. *Atherina breviceps* SSF 111.1. A1. PEM 2157 - L. 2.0 mm OD, 60 mm TL. A2. PEM 4592 (RUSI 14941) - R. 2.85 mm OD, 86 mm TL. A3. PEM 6424 - R. 3.1 mm OD, 89 mm TL. B. *Atherinomorus lacunosus* SSF 111.3. B1. 1210H - L. 2.45 mm OD, 69 mm TL. B2. PEM 15432 (RUSI 40584) - L. 3.65 mm OD, 110 mm TL. B3. PEM 8303 (RUSI 34146) - L. 4.10 mm OD, 132 mm TL. C. *Hypoatherina temminckii* SSF 111.6. C1. PEM 15576 (RUSI 42687) - L. c.2.3 mm OD, 75 mm TL. C2. PEM 15577 (RUSI 42687) - L. 2.4 mm OD, 74 mm TL. C3. PEM 2845 - L. 2.65 mm OD, 77 mm TL. LOPIIOTIDAE 220. D. *Lophotus lacepede* SSF 121.2. D1. PEM 6067 - R. 2.6 mm OD, 1130 mm SL. D2. PEM 15337 - R. 2.95 mm OD, 1130 mm TL. D3. PEM 14585 - L. 3.7 mm OD, 1017 mm TL. TRACIPIPTERIDAE 222. E. *Trachipterus trachipterus* SSF 119.3. E1. 1419H - L. 2.85 mm OD, 1650 mm TL. REGALECIDAE 223. F. *Agrostichthys parkeri* SSF 122.1. F1. PEM 13182 - L. 0.9 mm OD, 610 mm TL. Scale bars 1 mm (—).



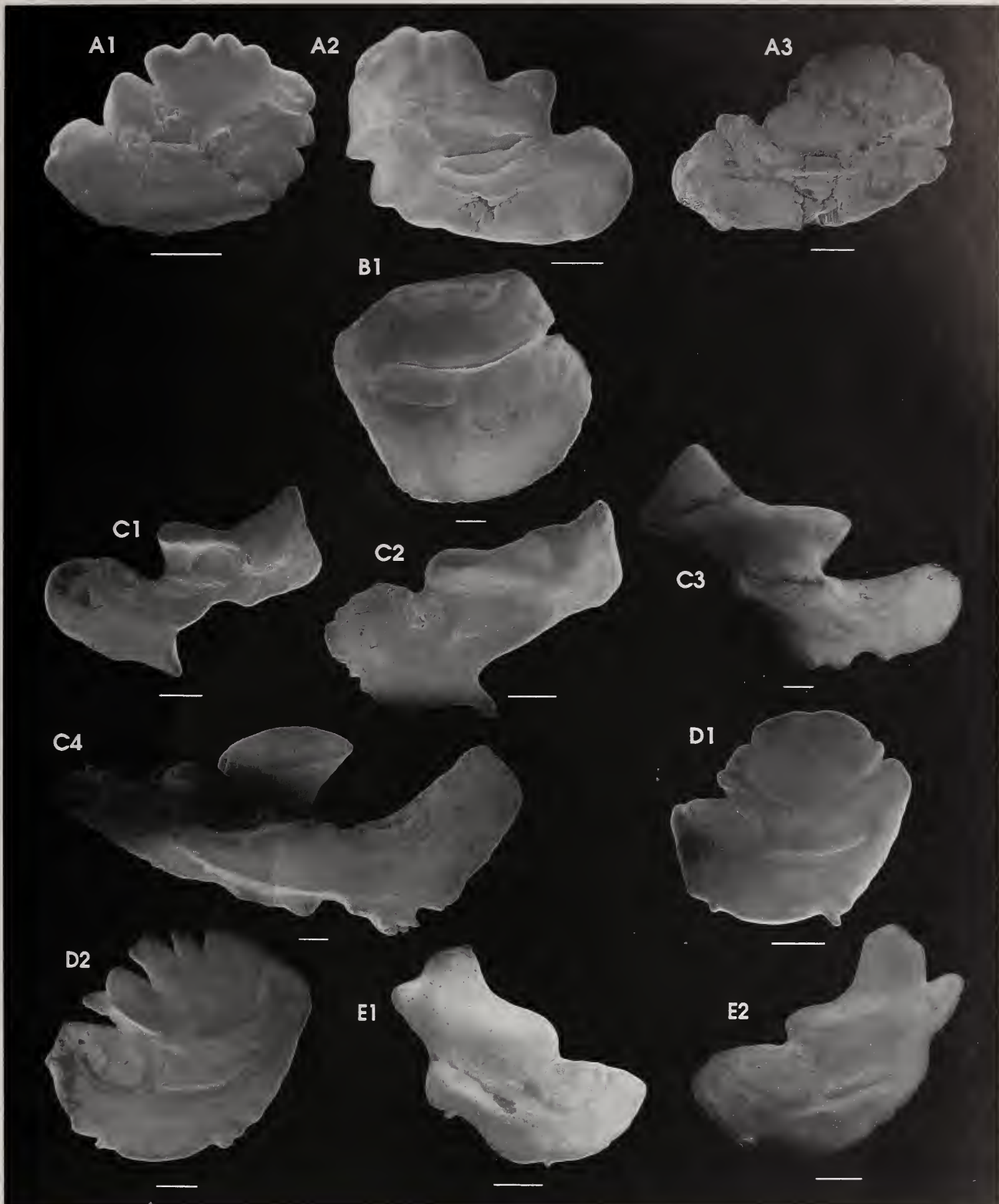


Plate 40. ATELEPODIDAE 225. A. *Ateleopus natalensis* SSF 124.2. A1. PEM 14496 (RUSI 31372) - R. 4.1 mm OD, 80 mm SL. A2. PEM 13060 (RUSI 28332) - L. 6.1 mm OD, 430 mm TL. A3. PEM 12949 (RUSI 28334) - R. 7.0 mm OD, 529 mm TL. MONOCENTRIDIDAE 229. B. *Monocentris japonicus* SSF 128.1. B1. PEM 0194 - L. 8.98 mm OD, 100 mm TL. TRACHICHIIDAE 230. C. *Hoplostethus atlanticus* SSF 127.2. C1. PEM 14098 - R. 6.7 mm OD, 222 mm TL. C2. PEM 13696 (RUSI 28325) - R. 6.9 mm OD, 218 mm TL. C3. PEM 14104 - L. 11.9 mm OD, 393 mm TL. C4. PEM 13853 - L. 17.0 mm OD, 435 mm TL. D. *H. mediterraneus* SSF 127.4. D1. PEM 12721 - R. 5.0 mm OD, 85 mm TL. D2. PEM 12720 (RUSI 28327) - R. 7.4 mm OD, 123 mm TL. E. *H. melanopus* SSF 127.6. E1. PEM 14751 - L. 6.0 mm OD, 147 mm TL. E2. PEM 14633 - R. 7.0 mm OD, 165 mm TL. Scale bars 1 mm (—).

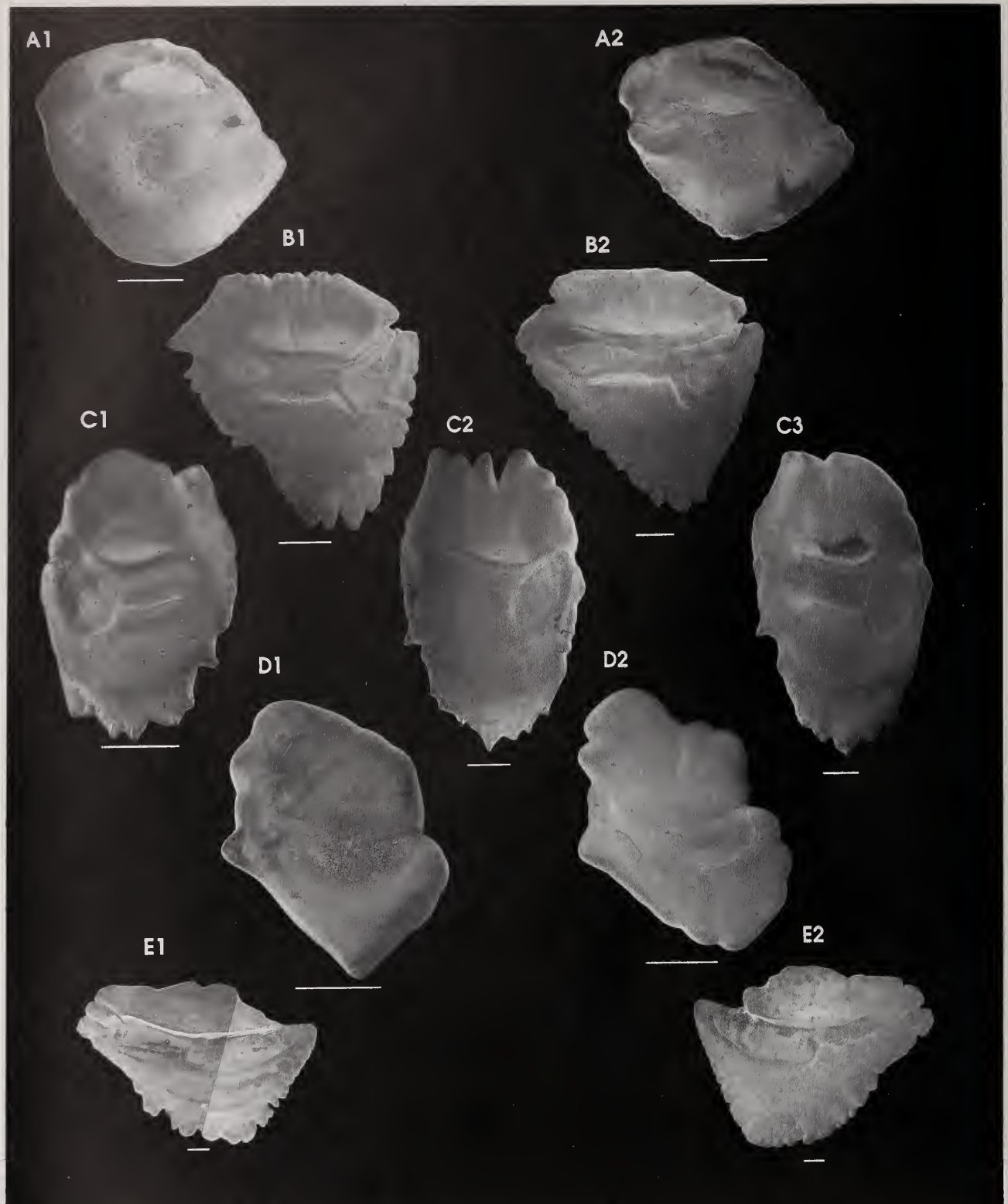


Plate 41. ANOMALOPIDAE 231. A. *Photoblepharon palpebratus steinitzi* SSF 129.1. A1. PEM 14255 - L. 3.9 mm OD, 85 mm TL. A2. PEM 14254 - L. 4.4 mm OD, 90 mm TL. DIRETMIDAE 232. B. *Diretmoides parini* SSF 130.1. B1. PEM 12008 - L. 6.0 mm OD, 80 mm SL. B2. PEM 12011 - L. 7.8 mm OD, 126 mm SL. C. *Diretmus argenteus* SSF 130.2. C1. PEM 14295 - R. 4.0 mm OD, 55 mm TL. C2. PEM 14293 - L. 7.0 mm OD, 86 mm SL. C3. PEM 13137 - L. 9.6 mm OD, 129 mm TL. ANOPILOGASTERIDAE 233. D. *Anoplogaster cornuta* SSF 131.1. D1. PEM 0932 - L. 3.4 mm OD. D2. PEM 13138 - L. 4.2 mm OD, 114 mm TL. BERYCIDAE 234. E. *Beryx splendens* SSF 126.2. E1. PEM 14192 - L. 12.0 mm OD, 340 mm TL. E2. PEM 14193 - R. 12.6 mm OD, 365 mm TL. Scale bars 1 mm (—).



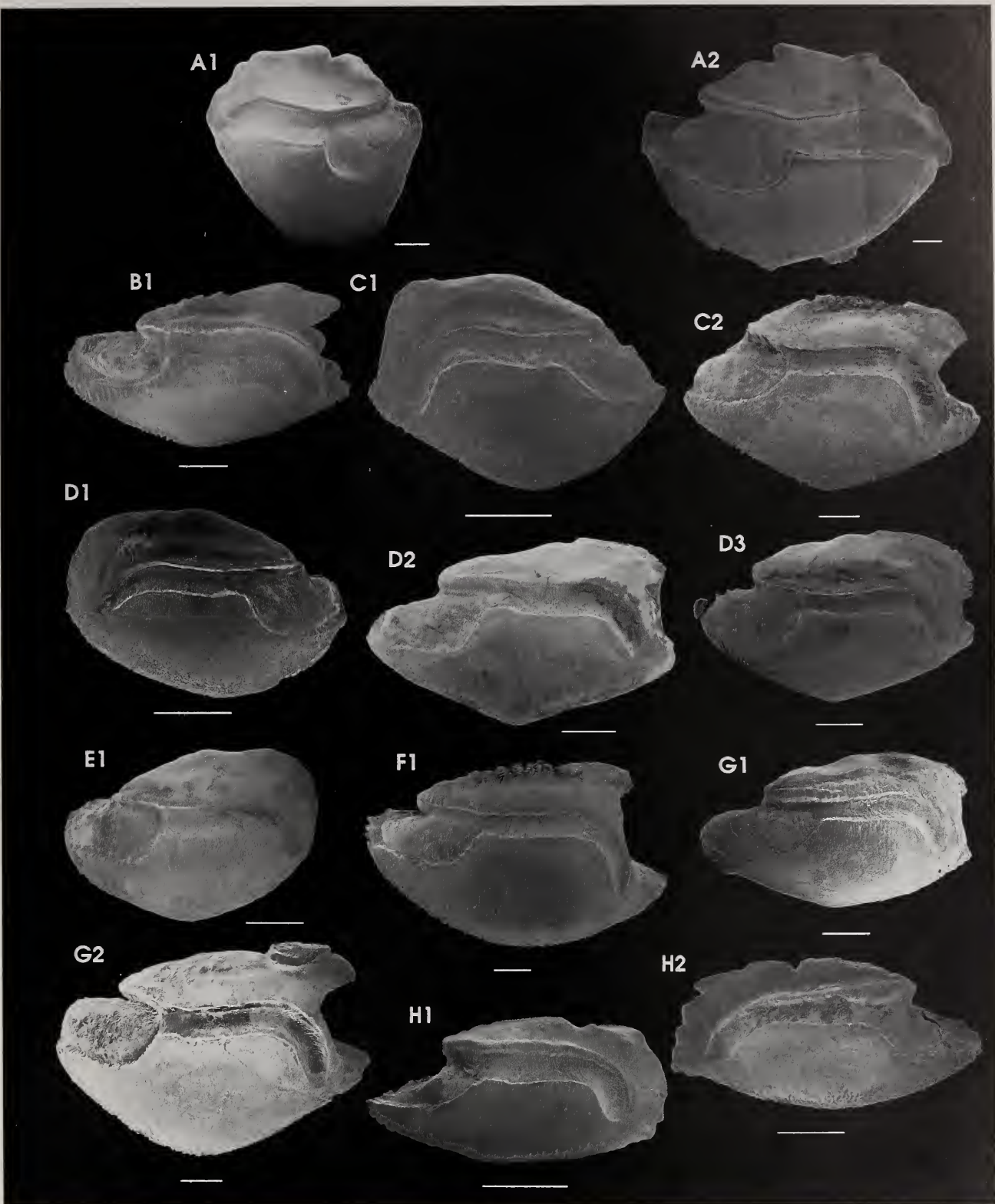


Plate 42. BERYCIDAE 234 ctd. A. *Centroberyx spinosus* SSF 126.3. A1. PEM 14913 (RUSI 35562) - L. 7.1 mm OD, 120 mm TL. A2. 1575H - R. 10.6 mm OD, 152 mm SL. HOLOCENTRIDAE 235. B. *Neoniphon sammara* SSF 132.4. B1. 1044H - R. 6.54 mm OD, 230 mm TL. C. *Sargocentron caudinaculatum* SSF 132.5. C1. PEM 14273 - L. 3.7 mm OD, 74 mm TL. C2. PEM 3923 (RUSI 16086) - R. 8.24 mm OD, 245 mm TL. D. *S. diadema* SSF 132.6. D1. PEM 14264 - L. 3.8 mm OD, 86 mm TL. D2. PEM 6667 (RUSI 21202) - R. 5.9 mm OD, 150 mm TL. D3. PEM 2865 - R. 6.3 mm OD, 173 mm TL. E. *S. inaequalis* SSF 132.7. E1. PEM 14223 (RUSI 30602) - R. 4.7 mm OD, 97 mm TL. F. *S. melanospilos* SSF 132.10. F1. 1045H - R. 8.72 mm OD, 231 mm TL. G. *S. praslin* SSF 132.12. G1. PEM 8664 - R. 5.8 mm OD, 148 mm TL. G2. PEM 5971 - R. 7.6 mm OD, 222 mm TL. H. *S. punctatissimum* SSF 132.13. H1. PEM 14271 - R. 3.8 mm OD, 94 mm TL. H2. PEM 2804 - L. 5.06 mm OD, 144 mm TL. Scale bars 1 mm (—).

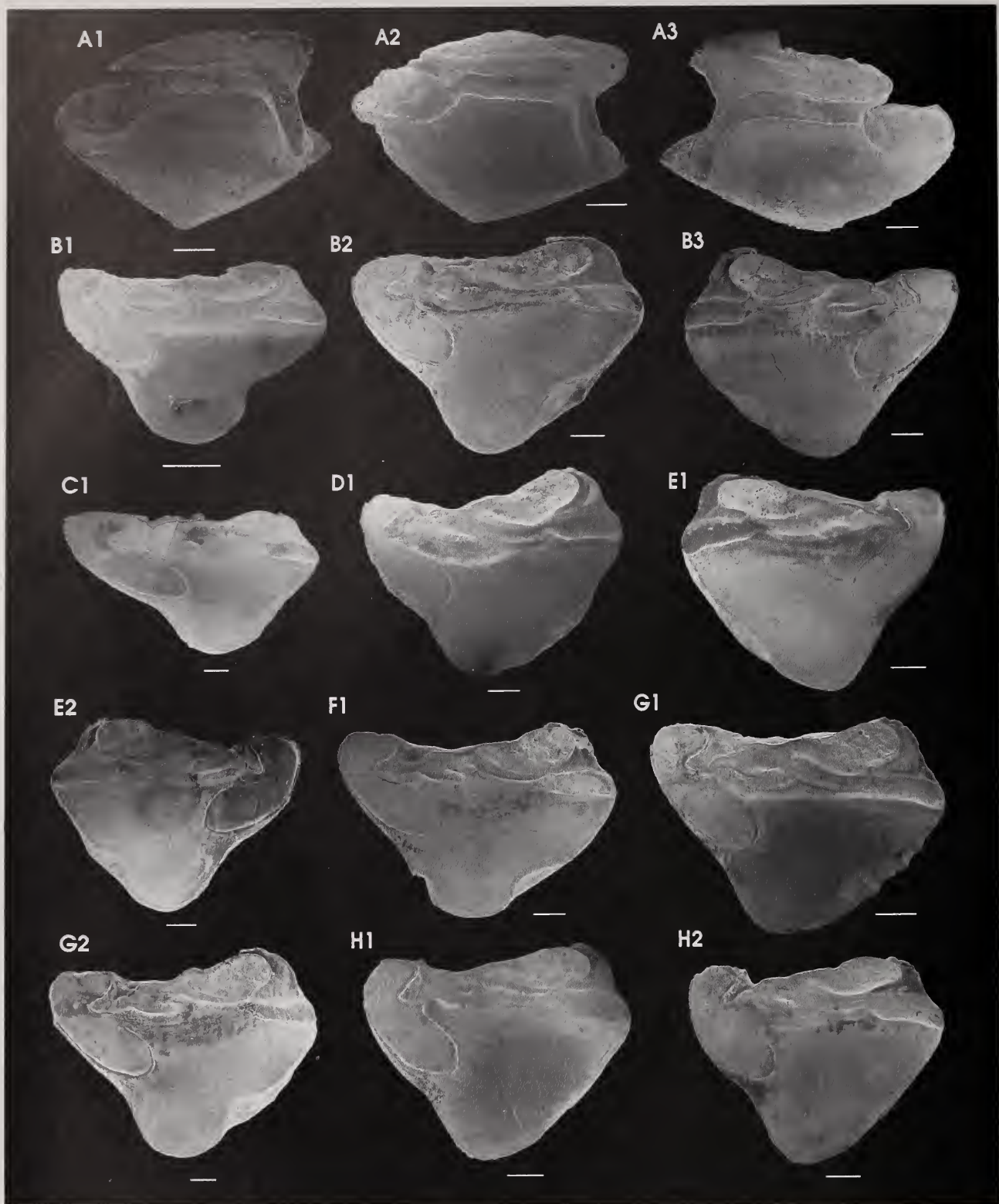


Plate 43. IIOLOCENTRIDAE 235 ctd. A. *Sargocentron spiniferum* SSF 132.16. A1. PEM 8337 (RUSI 37489) - R. 7.2 mm OD, 192 mm TL. A2. PEM 8336 (RUSI 37489) - R. 7.4 mm OD, 207 mm TL. A3. PEM 15575 (RUSI 42759) - L. 10.14 mm OD, 420 mm TL. B. *Myripristis berndti* SSF 132.21. B1. PEM 2793 - R. 4.75 mm OD, 67 mm TL. B2. PEM 7707 (RUSI 34094) - R. 9.4 mm OD, 202 mm TL. B3. PEM 4613 - L. 9.6 mm OD, 183 mm TL. C. *M. chryseres* SSF 132.22. C1. PEM 14859 (RUSI 35588) - R. 11.5 mm OD, 191 mm SL. D. *M. hexagona* SSF 132.23. D1. PEM 14552 (RUSI 31410) - R. 8.9 mm OD, 195 mm TL. E. *M. kuntee* SSF 132.24. E1. PEM 14231 (RUSI 30640) - L. 8.3 mm OD, 160 mm TL. E2. PEM 2791 - L. 9.82 mm OD, 195 mm TL. F. *M. melanosticta* SSF 132.25. F1. PEM 14232 - R. 9.3 mm OD, 203 mm TL. G. *M. murdjan* SSF 132.26. G1. PEM 5669 - R. 7.5 mm OD, 129 mm FL. G2. PEM 8783 - R. 10.0 mm OD, 229 mm TL. H. *M. pralinia* SSF 132.27. H1. PEM 14256 (RUSI 30681) - R. 7.9 mm OD, 146 mm TL. H2. PEM 14274 - R. 8.3 mm OD, 155 mm TL. Scale bars 1 mm (—).



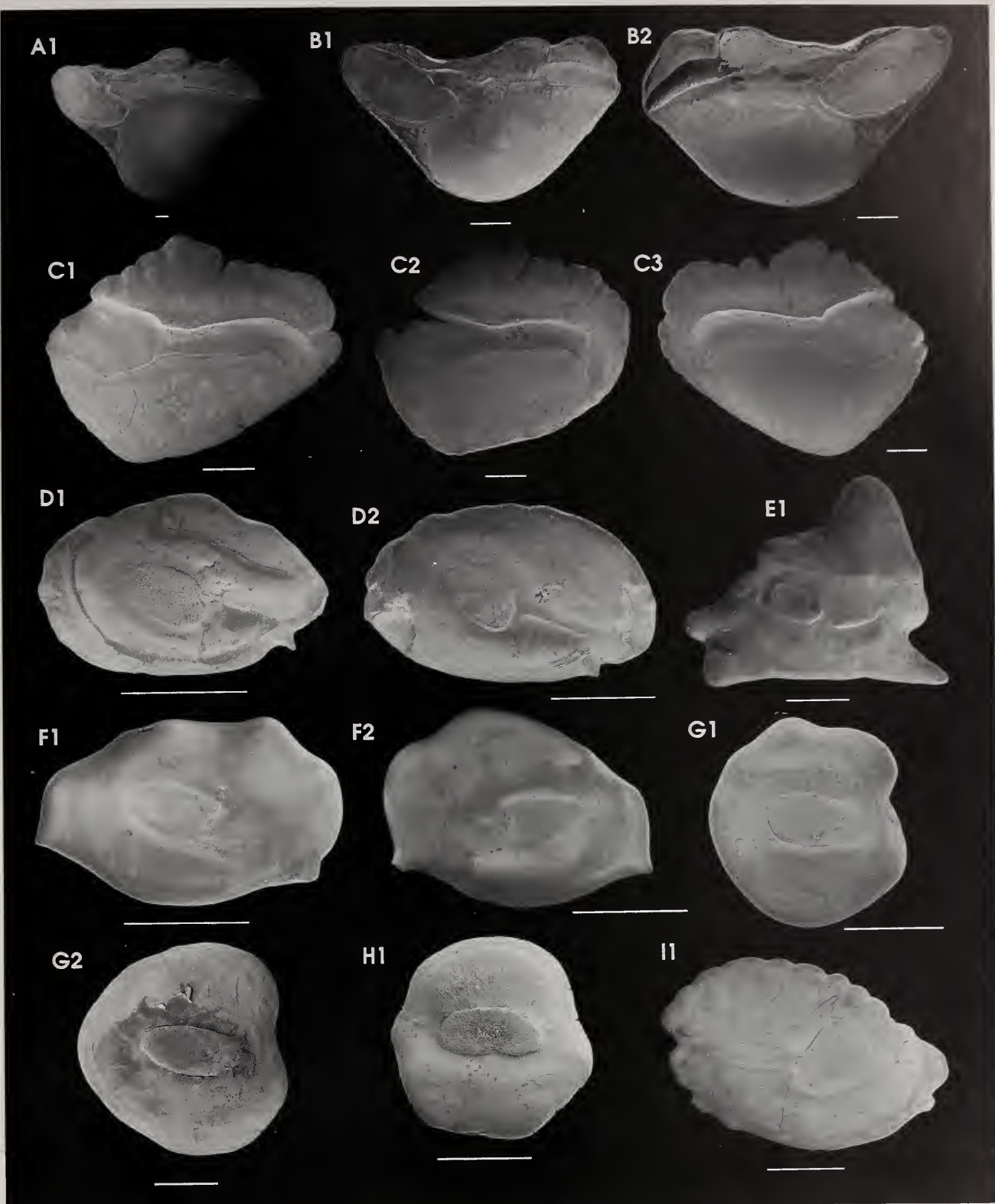


Plate 44. HOLOCENTRIDAE 235 etd. A. *Ostichthys kaianus* SSF 132.33. A1. PEM 14276 (RUSI 33523) - R. 18.2 mm OD, 268 mm TL. B. *Plectrypops lima* SSF 132.34. B1. PEM 14249 (RUSI 30655) - R. 8.0 mm OD, 105 mm TL. B2. PEM 2926 - L. 8.92 mm OD, 120 mm TL. POLYMIXIIDAE 236. C. *Polymixia berndti* SSF 134.1. C1. PEM 13028 (RUSI 28324) - R. 5.7 mm OD, 111 mm TL. C2. PEM 12786 (RUSI 28322) - R. 7.0 mm OD, 160 mm TL. C3. PEM 13029 (RUSI 28323) - L. 7.5 mm OD, 158 mm TL. MELAMPHIIDAE 238. D. *Melamphaes sinus* SSF 133.5. D1. 0276H - R. 2.35 mm OD, 100 mm SL. D2. 0278H - R. 3.0 mm OD, 235 mm SL. E. *Poromitra crassiceps* SSF 133.6. E1. PEM 0967 - R. 4.45 mm OD, 101 mm SL? F. *P. megalops* SSF 133.7. F1. PEM 3421 (SAM 28773) - R. 2.4 mm OD, c.36 mm SL. F2. PEM 3435 (SAM 28772) - L. 2.45 mm OD, c.41 mm SL. G. *Scopelogadus beanii* SSF 133.12. G1. PEM 3487 (SAM 28766) - L. 2.05 mm OD, c.45 mm SL. G2. 0875H - L. 3.5 mm OD. H. *S. mizolepis mizolepis* SSF 133.13. H1. 1328H - L. 2.25 mm OD, 56 mm SL. I. *Sio nordenskjoeldii* SSF 133.14. II. PEM 3477 (SAM 28771) - L. 3.85 mm OD, c.40 mm SL. Scale bars 1 mm (—).

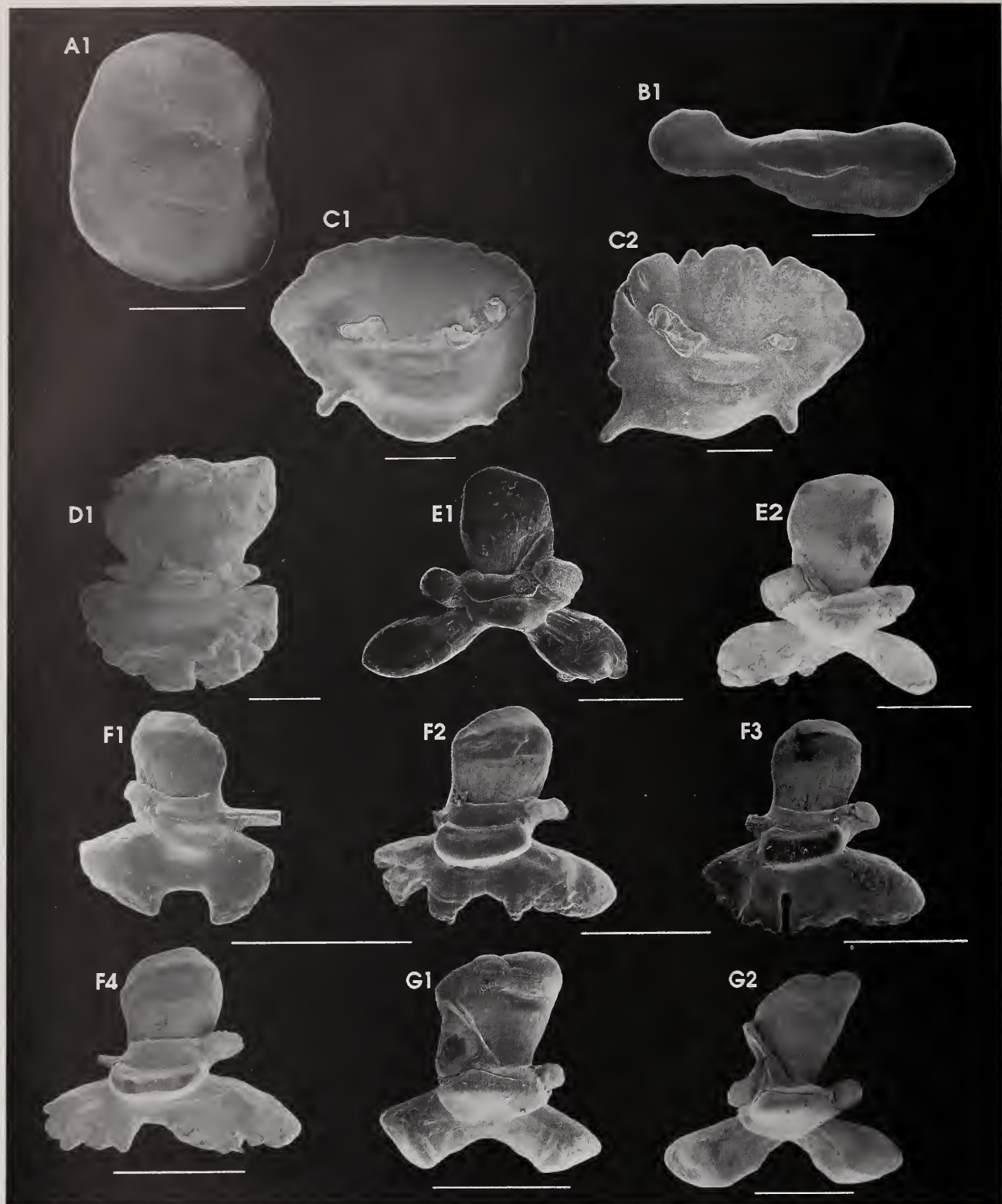


Plate 45. RONDELETIIDAE 240. A. *Rondeletia loricata* SSF 136.1. A1. PEM 13133 - L. 2.5 mm OD, 94 mm TL. BARBOURISIIDAE 241. B. *Barbourisia rufa* SSF 137.1. B1. PEM 13327 - L. 5.3 mm OD, 274 mm TL. MACROUROCYTTIDAE 244. C. *Zenion hololepis* SSF 141.1. C1. PEM 5048 (RUSI 13785) - L. 4.05 mm OD, 112 mm TL. C2. PEM 5049 (RUSI 13785) - R. 4.40 mm OD, 108 mm TL. ZEIDAE 245. D. *Cyttus traversi* SSF 138.2. D1. PEM 14425 (RUSI 28328) - R. 3.9 mm OD, 191 mm TL. E. *Zenopsis conchifer* SSF 138.3. E1. PEM 14704 - L. 2.6 mm OD, 490 mm TL. E2. PEM 14702 - R. 2.8 mm OD, 495 mm TL. F. *Zeus capensis* SSF 138.4. F1. PEM 12646 - R. 1.4 mm OD, 92 mm TL. F2. PEM 12196 (RUSI 28474) - L. 2.0 mm OD, 205 mm TL. F3. PEM 13435 - L. 2.1 mm OD, 240 mm TL. F4. PEM 12639 - L. 2.2 mm OD, 240 mm TL. G. *Z. faber* SSF 138.5. G1. PEM 15003 (RUSI 35575) - R. 1.6 mm OD, 194 mm TL. G2. 0142H - R. 2.45 mm OD, 400 mm TL. Scale bars 1 mm (—).



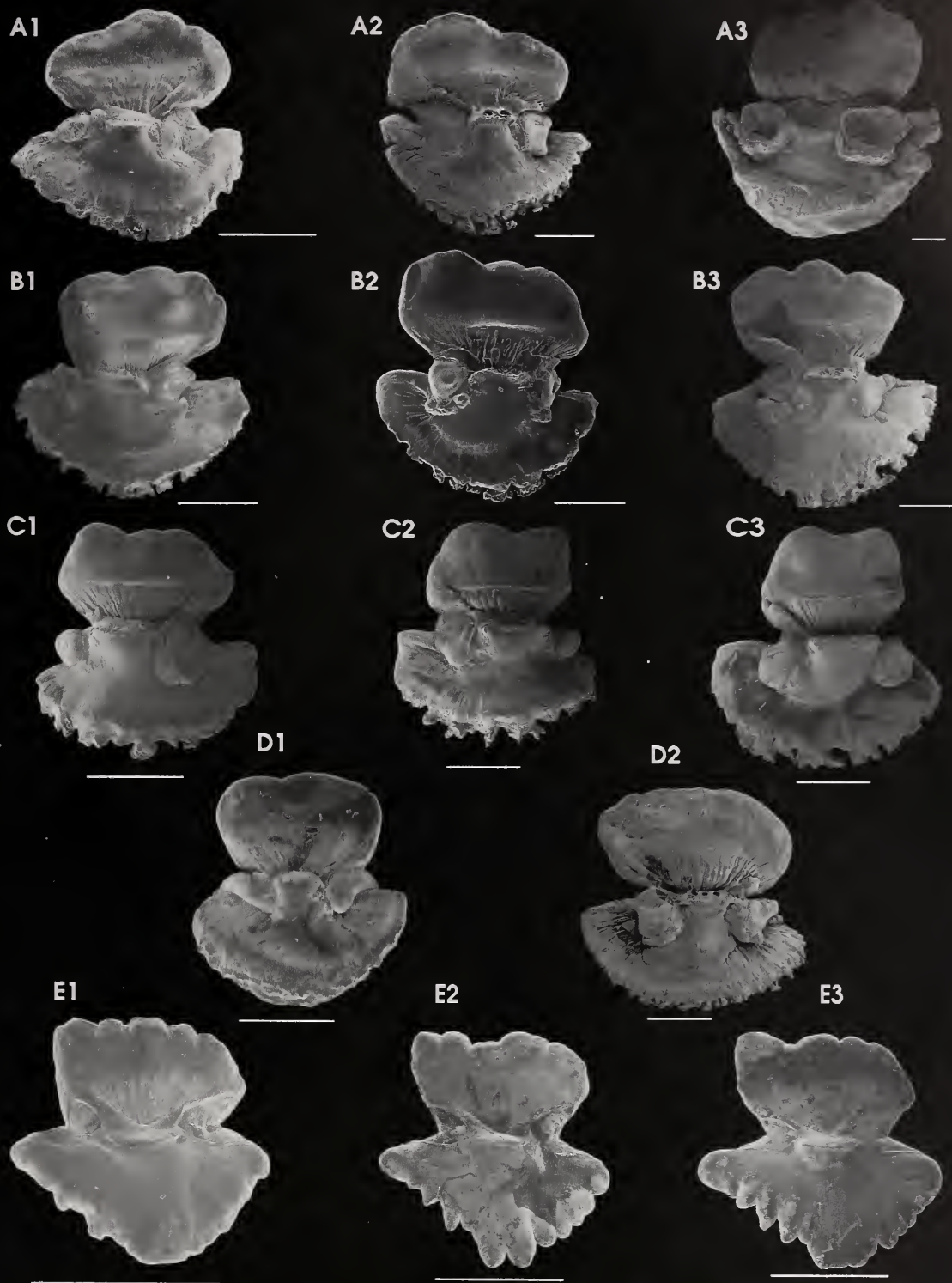


Plate 46. OREOSOMATIDAE 246. A. *Allocyttus verrucosus* SSF 139.2. A1. PEM 14940 (RUSI 35561) - L. 2.4 mm OD, 109 mm TL. A2. PEM 14938 (RUSI 35593) - R. 3.6 mm OD, 195 mm TL. A3. PEM 13893 - L. 7.7 mm OD, 360 mm TL. B. *Neocyttus rhomboidalis* SSF 139.3. B1. PEM 13846 - L. 3.3 mm OD, 162 mm TL. B2. PEM 9047 (RUSI 37520) - R. 3.4 mm OD, 215 mm TL. B3. PEM 13844 - R. 4.3 mm OD, 238 mm TL. C. *Oreosoma atlanticum* SSF 139.4. C1. PEM 11406 (RUSI 28331) - L. 2.5 mm OD, 140 mm TL. C2. PEM 11402 (RUSI 28330) - R. 3.05 mm OD, 160 mm TL. C3. PEM 11404 - R. 3.4 mm OD, 184 mm TL. D. *Pseudocyttus maculatus* SSF 139.5. D1. PEM 12072 - L. 2.5 mm OD, 154 mm TL. D2. PEM 14587 - R. 4.2 mm OD, 365 mm TL. GRAMMICOLEPIDIDAE 247. E. *Xenolepidichthys dalgleishi* SSF 140.2. E1. PEM 13433 - L. 1.3 mm OD, 49 mm TL. E2. PEM 12796 (RUSI 28329) - L. 2.02 mm OD, 88 mm TL. E3. PEM 12129 - L. 2.5 mm OD, 97 mm TL. Scale bars 1 mm (—).

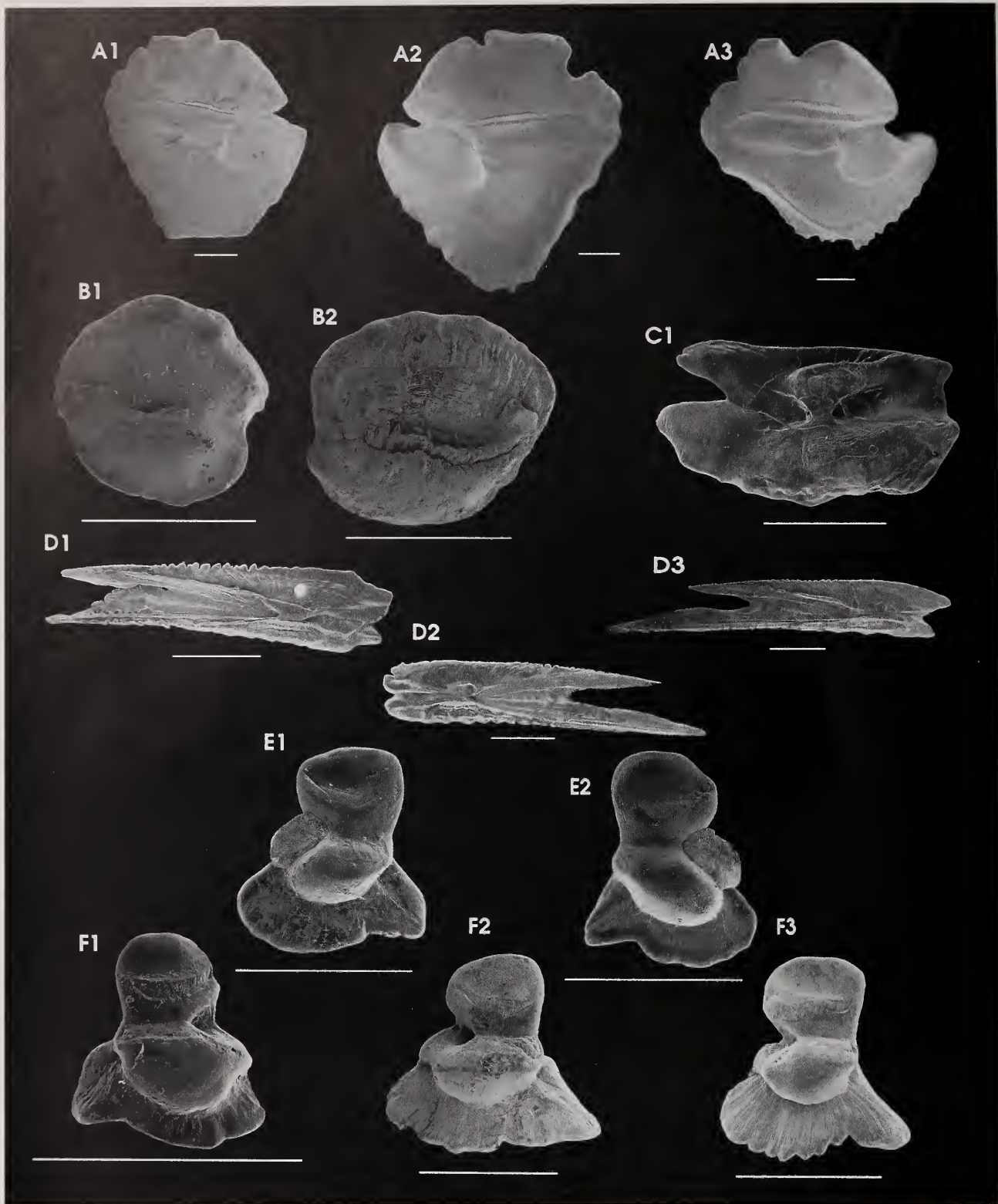


Plate 47. CAPROIDAE 248. A. *Antigonia rubescens* SSF 162.1. A1. PEM 14984 (RUSI 35599) - L. 5.1 mm OD, 89 mm TL. A2. PEM 14983 (RUSI 35599) - R. 6.2 mm OD, 106 mm TL. A3. PEM 14980 (RUSI 35599) - L. 6.6 mm OD, 112 mm TL. PEGASIDAE 253. B. *Eurypegasmus draconis* SSF 142.1. B1. PEM 14329 (RUSI 30386) - R. 1.4 mm OD, 84 mm TL. B2. PEM 14540 (RUSI 31371) - L. 1.8 mm OD, 92 mm TL. AULOSTOMIDAE 254. C. *Aulostomus chinensis* SSF 143.1. C1. 0775H - R. 2.65 mm OD, 690 mm TL. FISTULARIIDAE 255. D. *Fistularia commersonii* SSF 144.1. D1. PEM 15716 - R. 3.85 mm OD, 1095 mm TL. D2. PEM 15718 - L. 5.06 mm OD, 970 mm TL. D3. PEM 15712 - R. 6.28 mm OD, 1310 mm TL. MACRORHAMPHOSIDAE 256. E. *Macroramphosus scolopax* SSF 147.2. E1. PEM 12860 (RUSI 28336) - R. 1.2 mm OD, 120 mm TL. E2. PEM 12857 (RUSI 28337) - L. 1.25 mm OD, 137 mm TL. F. *Notopogon macrosolen* SSF 147.4. F1. PEM 12066 - L. 0.75 mm OD, 53 mm SL. F2. PEM 11103 - R. 1.4 mm OD, 207 mm SL. F3. PEM 12065 - R. 1.5 mm OD, 236 mm TL. Scale bars 1 mm (—).



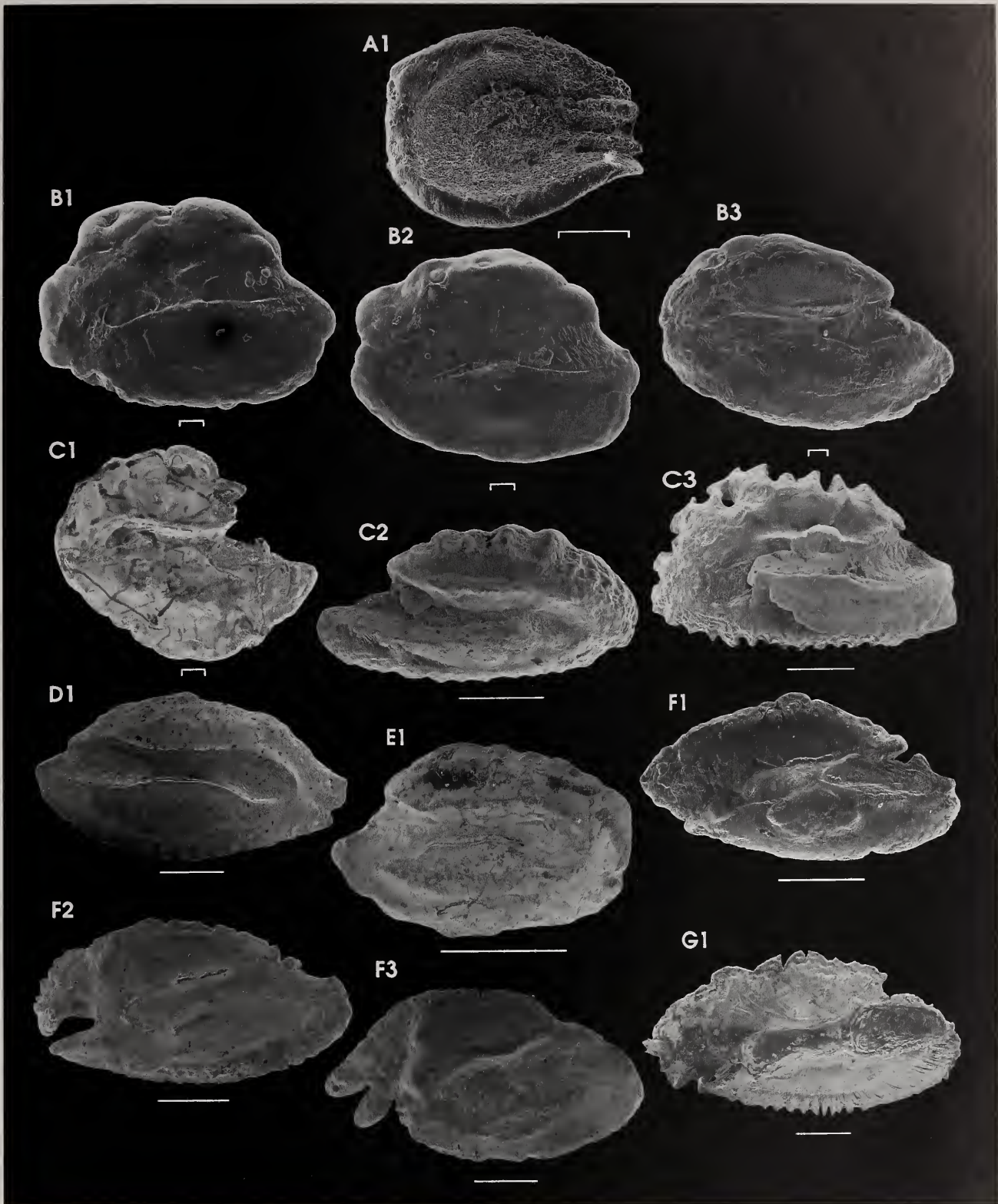


Plate 48. SYNGNATHIDAE 259. A. *Trachyrhamphus bicoarctatus* SSF 145.31. A1. PEM 15744 - L. 0.4 mm OD, 375 mm TL. DACTYLOPTERIDAE 260. B. *Dactyloptena orientalis* SSF 159.1. B1. PEM 4270 (RUSI 12782) - L. 1.25 mm OD, 48 mm TL. B2. PEM 4271 (RUSI 12782) - L. 1.3 mm OD, 51 mm TL. B3. PEM 0763 - L. 1.65 mm OD, 61 mm TL. C. *D. peterseni* SSF 159.2. C1. PEM 7308 (RUSI 28488) - L. 1.4 mm OD, 170 mm TL. C2. PEM 14809 (RUSI 31421) - R. 4.1 mm OD, 239 mm TL. C3. PEM 9331 (RUSI 37491) - L. 5.0 mm OD, 310 mm TL. SCORPAENIDAE 262. D. *Apistus carinatus* SSF 149.1. D1. PEM 0408 - R. 5.0 mm OD, 82 mm TL. E. *Minous coccineus* SSF 149.3. E1. PEM 0227 - R. 2.4 mm OD, 50 mm TL. F. *Dendrochirus brachypterus* SSF 149.4. F1. PEM 15389 (RUSI 40575) - L. 3.75 mm OD, 86 mm TL. F2. 1054H - L. 4.72 mm OD, 116 mm TL. F3. 1288H - L. 5.4 mm OD, 130 mm TL. G. *Parapterois heterurus* SSF 149.6. G1. PEM 0240 - L. 6.28 mm OD, 220 mm TL. Scale bars 1 mm (—) or 0.1 mm (┐).

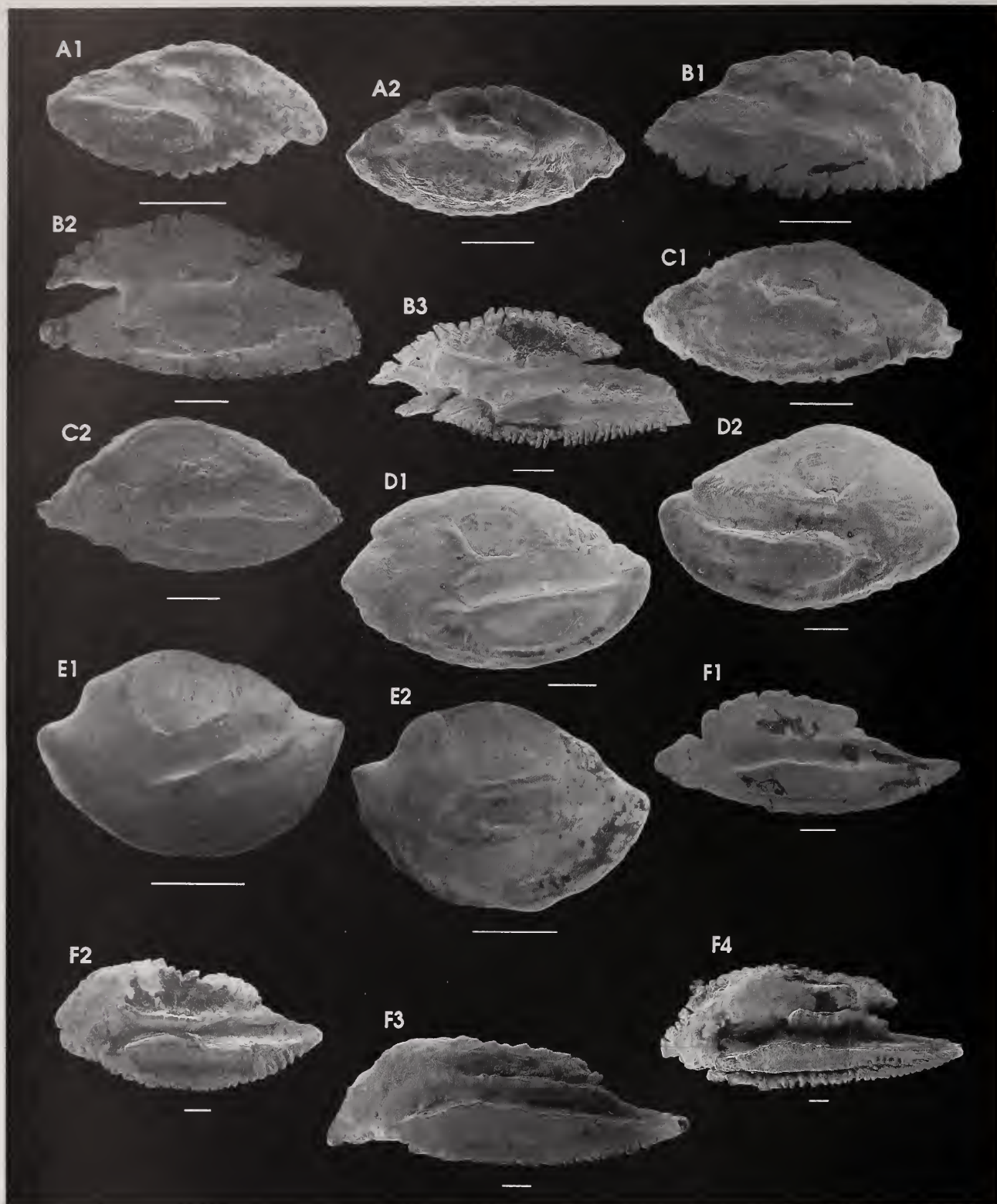


Plate 49. SCORPAENIDAE 262 ctd. A. *Pterois antennata* SSF 149.7. A1. PEM 14520 (RUSI 31368) - R. 3.5 mm OD, 77 mm TL. A2. PEM 15622 - R. 4.0 mm OD, 110 mm TL. B. *P. miles* SSF 149.8. B1. PEM 14791 (RUSI 31451) - R. 4.3 mm OD, 241 mm TL. B2. PEM 6593 (RUSI 31617) - L. 6.2 mm OD, 296 mm TL. B3. PEM 6471 - L. 8.5 mm OD, 372 mm TL. C. *P. radiata* SSF 149.10. C1. PEM 14261 - R. 5.3 mm OD, 118 mm TL. C2. 1002H - L. 6.22 mm OD, 160 mm TL. D. *Neomerinthe nielseni* SSF 149.14. D1. PEM 14992 (RUSI 35558) - L. 6.9 mm OD, 129 mm TL. D2. PEM 14991 (RUSI 35558) - R. 7.5 mm OD, 135 mm TL. E. *Phenacoscorpius adenensis* SSF 149.17. E1. PEM 3499 - L. 3.45 mm OD, 54 mm TL. E2. PEM 3502 - L. 3.65 mm OD, 55 mm TL. F. *Scorpaena scrofa* SSF 149.21. F1. PEM 11345 (RUSI 28341) - L. 9.6 mm OD, 204 mm TL. F2. PEM 12469 - L. 11.1 mm OD, 313 mm TL. F3. PEM 8277 - L. 13.0 mm OD, 314 mm TL. F4. PEM 6779 - L. 16.5 mm OD, 459 mm TL. Scale bars 1 mm (—).



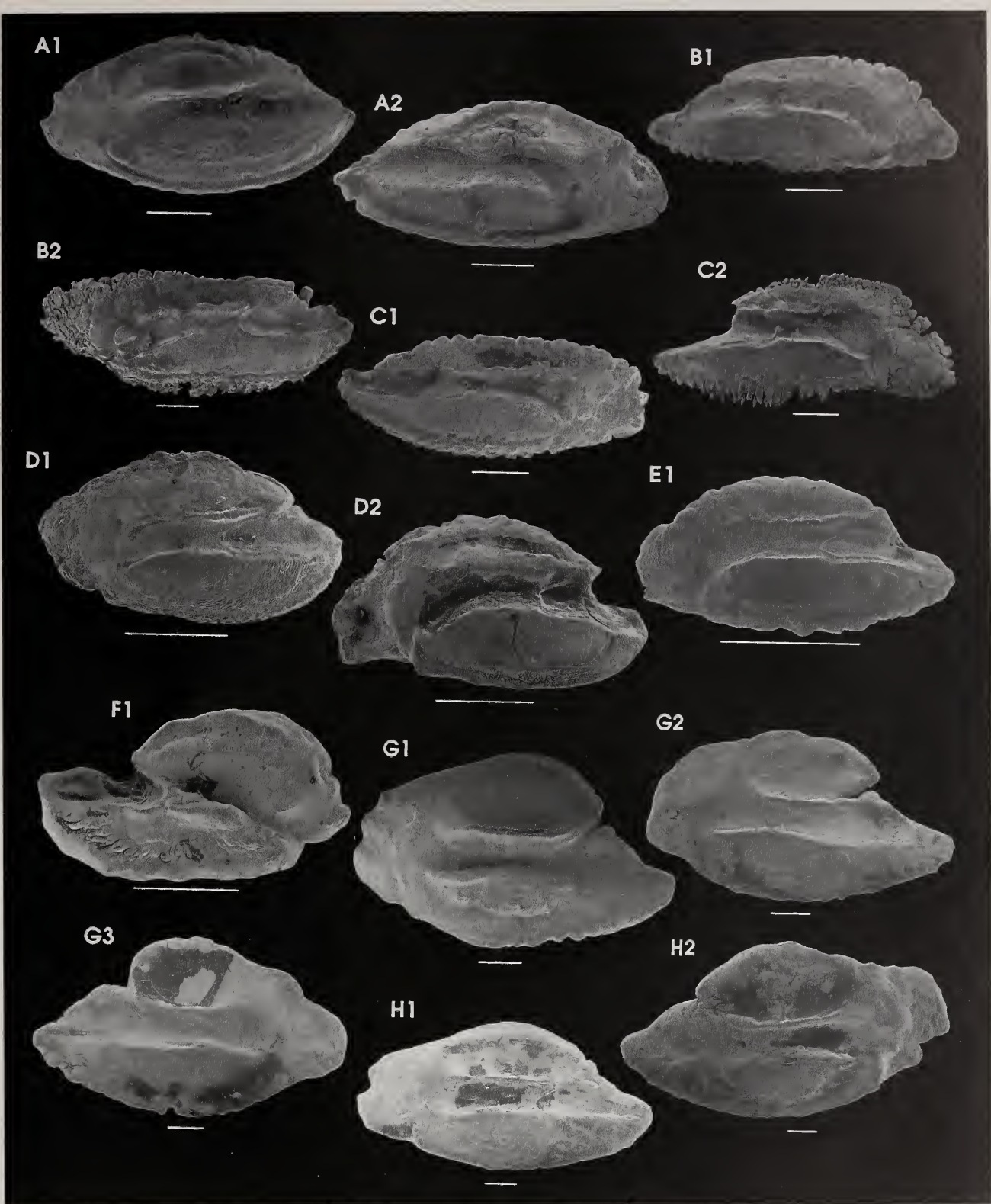


Plate 50. SCORPAENIDAE 262 ctd. A. *Scorpaenodes parvipinnis* SSF 149.28. A1. PEM 14279 (RUSI 30845) - L. 5.1 mm OD, 98 mm TL. A2. PEM 2763 - R. 5.64 mm OD, 103 mm TL. B. *Scorpaenopsis gibbosa* SSF 149.32. B1. PEM 6650 - R. 5.5 mm OD, 146 mm TL. B2. PEM 2320 - L. 7.92 mm OD, 226 mm TL. C. *S. venosa* SSF 149.36. C1. PEM 8162 (RUSI 34059) - R. 5.8 mm OD, 147 mm TL. C2. PEM 6739 - R. 7.1 mm OD, 173 mm TL. D. *Sebastapistes cyanostigma* SSF 149.37. D1. PEM 2764 - L. 3.0 mm OD, 59 mm TL. D2. PEM 14272 - L. 3.4 mm OD, 62 mm TL. E. *S. strongia* SSF 149.39. E1. PEM 8414 (RUSI 34118) - L. 2.5 mm OD, 42 mm TL. F. *Taenianotus triacanthus* SSF 149.41. F1. PEM 14578 (RUSI 31442) - R. 3.3 mm OD, 90 mm TL. G. *Helicolenus dactylopterus* SSF 149.42. G1. PEM 14583 (RUSI 31383) - L. 8.5 mm OD, 180 mm TL. G2. PEM 7812 (RUSI 28340) - L. 9.3 mm OD, 220 mm TL. G3. PEM 7811 (RUSI 28339) - R. 9.8 mm OD, 238 mm TL. H. *Sebastes capensis* SSF 149.43. H1. PEM 12090 - L. 9.9 mm OD, 179 mm SL. H2. PEM 12119 - R. 12.5 mm OD, 290 mm TL. Scale bars 1 mm (—).

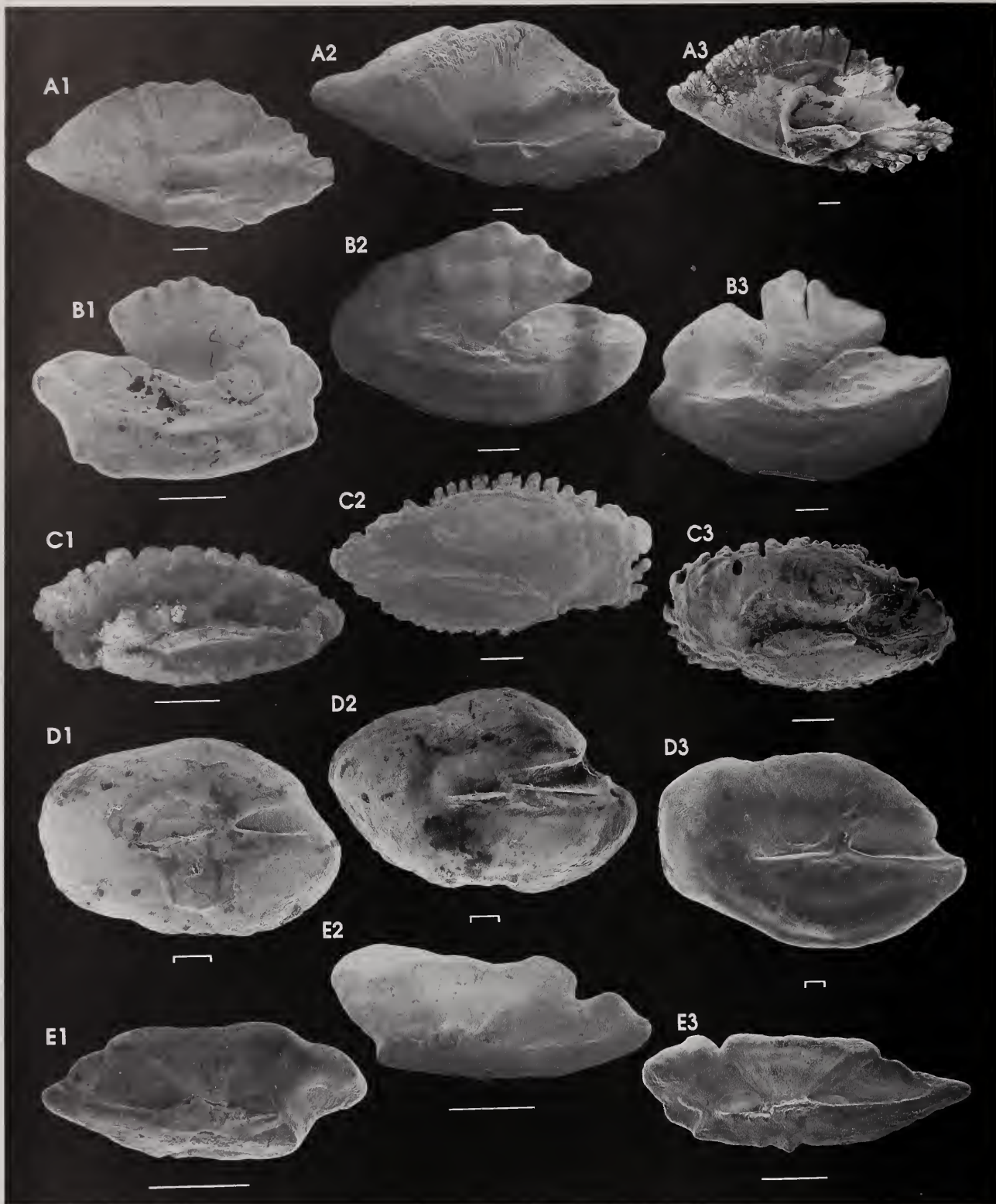


Plate 51. SCORPAENIDAE 262 ctd. A. *Trachyscorpia capensis* SSF 149.44. A1. PEM 14070 - L. 9.6 mm OD, 190 mm TL. A2. PEM 14075 - L. 12.7 mm OD, 278 mm TL. A3. PEM 14071 - L. 14.5 mm OD, 347 mm TL. B. *Setarches guentheri* SSF 149.45. B1. PEM 15029 (RUSI 35526) - R. 4.8 mm OD, 97 mm TL. B2. PEM 5020 (RUSI 13998) - L. 8.12 mm OD, 165 mm TL. B3. PEM 5019 (RUSI 13998) - L. 10.12 mm OD, 208 mm TL. C. *Synanceia verrucosa* SSF 149.46. C1. PEM 9641 (RUSI 37495) - L. 5.0 mm OD, 150 mm TL. C2. PEM 14568 - R. 8.4 mm OD, 325 mm TL. C3. PEM 14566 - L. 8.9 mm OD, 325 mm TL. D. *Coccolropsis gymnodeima* SSF 150.2. D1. PEM 5366 - L. 0.85 mm OD, 20 mm TL. D2. PEM 4199 (RUSI 12781) - L. 1.1 mm OD, 24 mm TL. D3. PEM 4639 - L. 1.6 mm OD, 35 mm TL. CONGIPODIDAE 267. E. *Congiopodus spinifer* SSF 152.1. E1. PEM 12679 (RUSI 28352) - R. 3.3 mm OD, 176 mm TL. E2. PEM 12665 - L. 3.9 mm OD, 235 mm TL. E3. PEM 12327 - L. 4.9 mm OD, 288 mm TL. Scale bars 1 mm (—) or 0.1 mm (—),



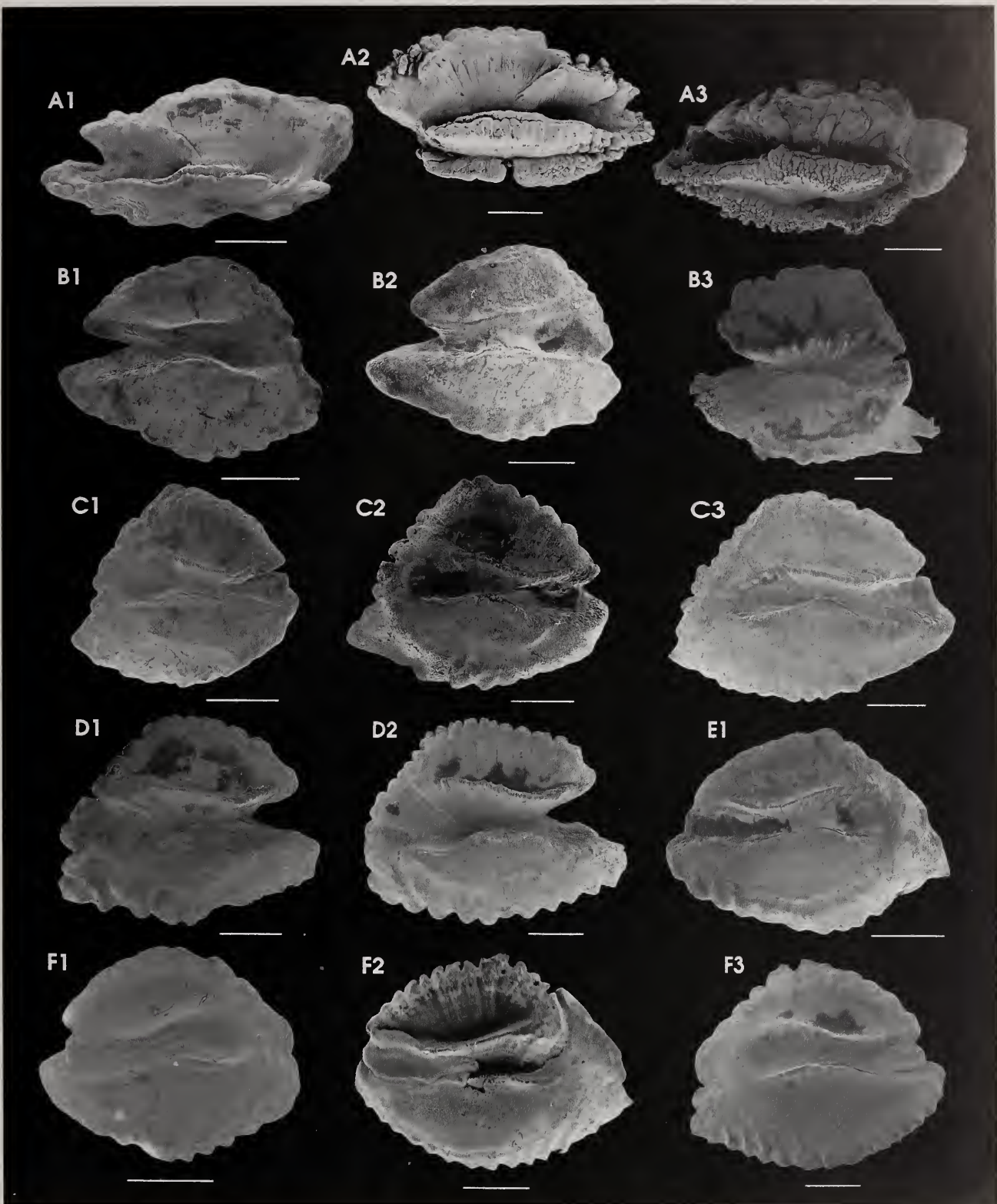


Plate 52. CONGIOPODIDAE 267 ctd. A. *Congiopus torvus* SSF 152.2. A1. PEM 2241 - R. 4.5 mm OD, 390 mm TL. A2. PEM 2242 - L. 5.58 mm OD, 495 mm TL. A3. PEM 1145 - R. 6.24 mm OD, 483 mm TL. TRIGLIDAE 268. B. *Chelidonichthys capensis* SSF 157.1. B1. PEM 3035 - R. 3.51 mm OD, 234 mm TL. B2. PEM 7017 (RUSI 34096) - R. 4.0 mm OD, 247 mm TL. B3. PEM 12743 - R. 7.4 mm OD, 605 mm TL. C. *C. kumu* SSF 157.2. C1. PEM 11680 - L. 3.3 mm OD, 210 mm TL. C2. PEM 12940 (RUSI 34171) - L. 4.4 mm OD, 240 mm TL. C3. PEM 14415 - L. 5.1 mm OD, 300 mm TL. D. *C. queketti* SSF 157.3. D1. PEM 3283 (RUSI 11641) - L. 4.4 mm OD, 276 mm TL. D2. PEM 12753 - L. 4.9 mm OD, 302 mm TL. E. *Lepidotrigla faurei* SSF 157.4. E1. PEM 0456 - R. 4.0 mm OD, 161 mm TL. F. *L. multispinosa* SSF 157.5. F1. PEM 12992 - R. 3.7 mm OD, 103 mm TL. F2. PEM 12991 (RUSI 28349) - R. 4.6 mm OD, 140 mm TL. F3. PEM 12994 - L. 5.1 mm OD, 160 mm TL. Scale bars 1 mm (—).

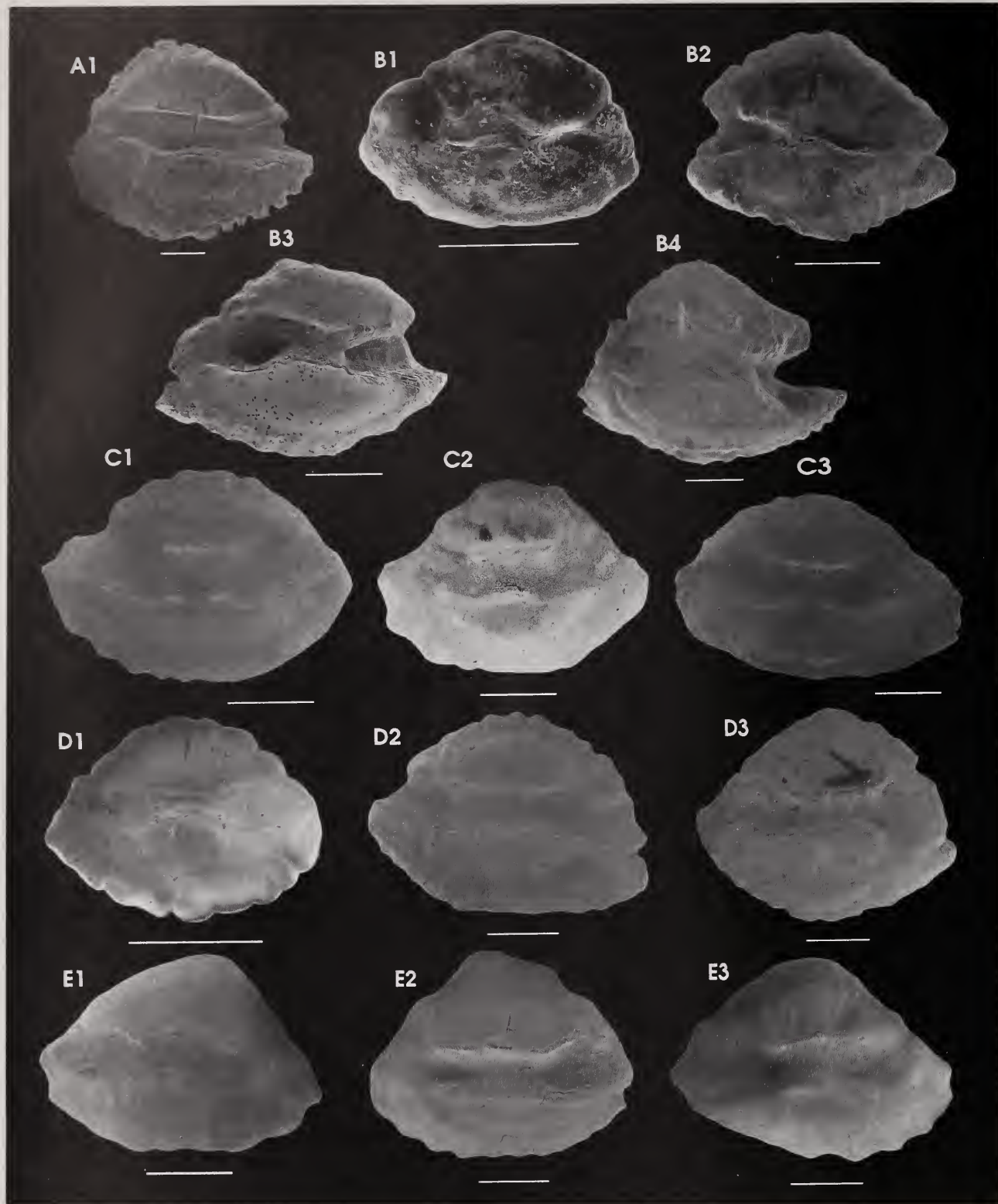


Plate 53. TRIGLIDAE 268 ctd. A. *Trigla lyra* SSF 157.6. A1. 0283H - L. 5.6 mm OD, 460 mm SL. B. *Trigloporus lastoviza africanus* SSF 157.7. B1. PEM 11660 (RUSI 28508) - L. 2.0 mm OD, 77 mm TL. B2. PEM 12463 (RUSI 28347) - R. 3.3 mm OD, 185 mm TL. B3. PEM 15039 (RUSI 35573) - L. 3.9 mm OD, 196 mm TL. B4. PEM 12470 (RUSI 28348) - L. 4.9 mm OD, 235 mm TL. C. *Peristedion weberi* SSF 158.1. C1. PEM 12825 - R. 3.8 mm OD, 157 mm TL. C2. PEM 12804 (RUSI 28346) - R. 4.0 mm OD, 170 mm TL. C3. PEM 12803 (RUSI 28345) - R. 4.5 mm OD, 199 mm TL. D. *Satyrichthys adeni* SSF 158.2. D1. PEM 14450 (RUSI 28342) - R. 2.5 mm OD, 112 mm TL. D2. PEM 12941 - R. 4.1 mm OD, 248 mm TL. D3. PEM 14362 (RUSI 28343) - R. 4.5 mm OD, 272 mm TL. E. *S. investigatoris* SSF 158.3. E1. PEM 5023 (RUSI 14096) - R. 3.35 mm OD, 215 mm TL. E2. PEM 5024 (RUSI 14096) - L. 3.85 mm OD, 220 mm TL. E3. PEM 5022 (RUSI 14096) - R. 4.0 mm OD, 237 mm TL. Scale bars 1 mm (—).



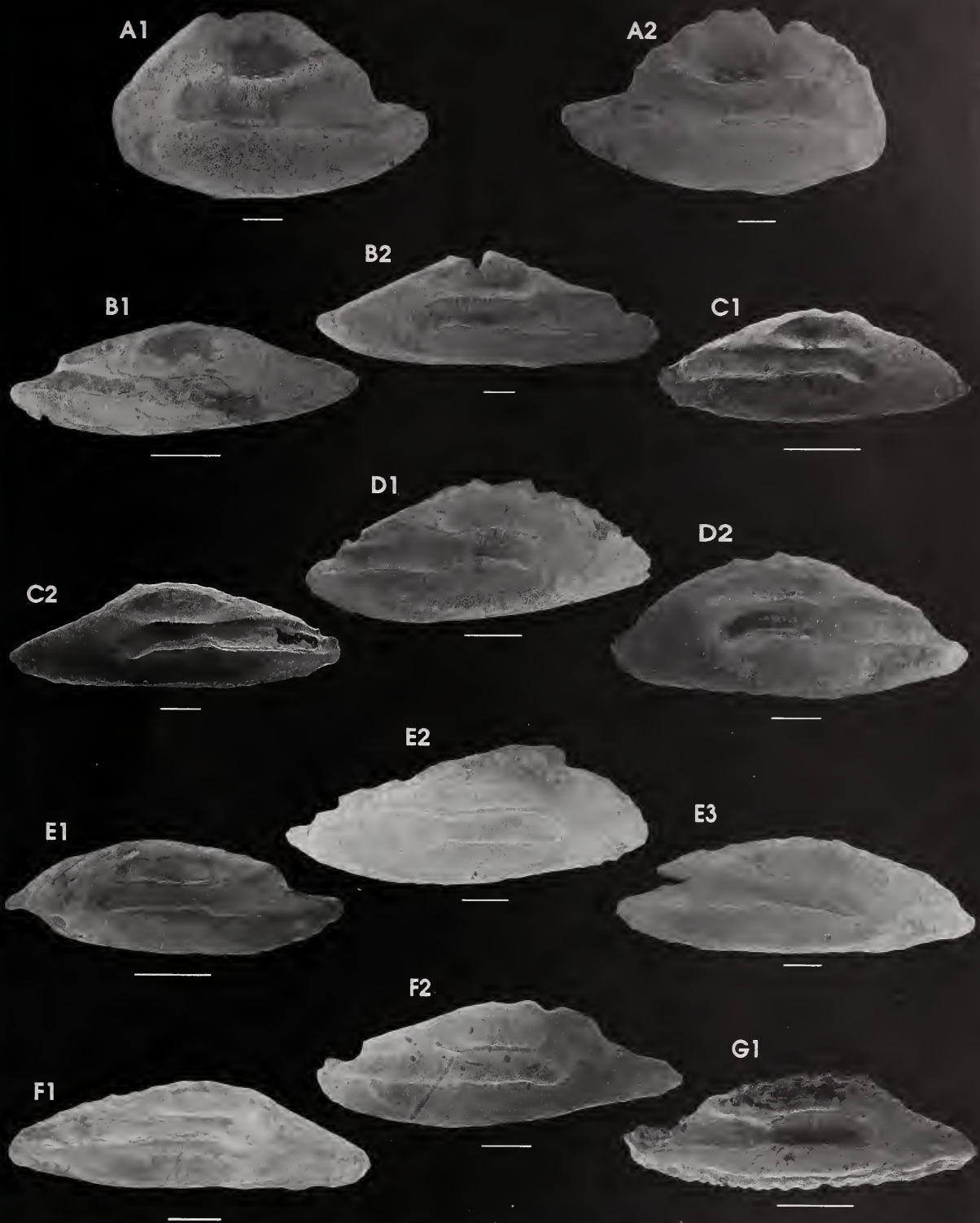


Plate 54. PLATYCEPHALIDAE 269. A. *Parabembras robinsoni* SSF 154.1. A1. PEM 13047 (RUSI 28351) - L. 8.3 mm OD, 205 mm TL. A2. PEM 11989 - R. 9.2 mm OD, 221 mm TL. B. *Cociella crocodila* SSF 155.1. B1. PEM 0609 - R. 5.1 mm OD, 135 mm TL. B2. PEM 6617 - L. 11.0 mm OD, 295 mm TL. C. *Cociella* sp. SSF 155.2. C1. PEM 15270 (RUSI 36880) - R. 4.4 mm OD, 106 mm TL. C2. PEM 15268 (RUSI 36880) - L. 9.2 mm OD, 236 mm TL. D. *Grammoplites portuguesus* SSF 155.3. D1. PEM 0607 - R. 6.42 mm OD, 130 mm TL. D2. PEM 0608 - L. 7.28 mm OD, 160 mm TL. E. *Platycephalus indicus* SSF 155.6. E1. PEM 1037 - L. 4.52 mm OD, 154 mm TL. E2. PEM 6651 (RUSI 20011) - R. 8.1 mm OD, 298 mm TL. E3. PEM 6108 - R. 9.7 mm OD, 455 mm TL. F. *Sorsogona prionota* SSF 155.7. F1. PEM 6427 - R. 7.2 mm OD, 196 mm TL. F2. PEM 15546 (RUSI 42632) - R. 7.5 mm OD, 155 mm TL. G. *Thysanophrys arenicola* SSF 155.8. G1. PEM 15634 - R. 4.85 mm OD, 160 mm TL. Scale bars 1 mm (—).

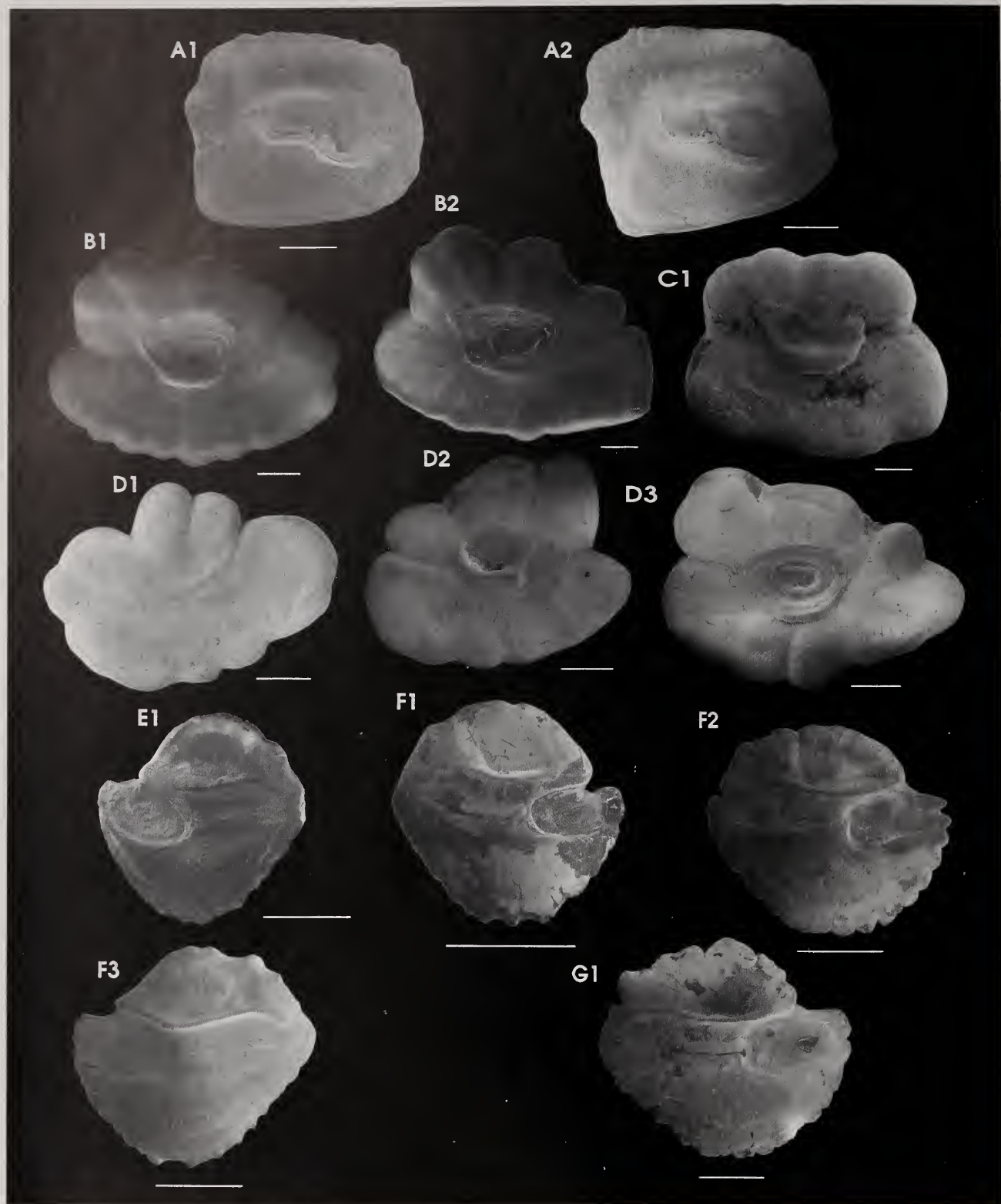


Plate 55. HOPLICHITHYIDAE 270. A. *Hoplichthys acanthopleurus* SSF 156.1. A1. PEM 12884 - L. 4.6 mm OD, 128 mm TL. A2. PEM 12881 (RUSI 28353) - L. 4.8 mm OD, 138 mm TL. PSYCHROLUTIDAE 279. B. *Ebinania costaecanarie* SSF 160.2. B1. PEM 14456 (RUSI 31464) - L. 7.3 mm OD, 206 mm TL. B2. PEM 14457 (RUSI 31465) - L. 8.0 mm OD, 285 mm TL. C. *Psychrolutes inermis* SSF 160.3. C1. PEM 14622 - 7.4 mm OD, 401 mm TL. D. *P. macrocephalus* SSF 160.4. D1. PEM 14327 (RUSI 28354) - 5.7 mm OD, 183 mm TL. D2. PEM 12207 - 5.8 mm OD, 194 mm TL. D3. PEM 13690 - 6.4 mm OD, 218 mm TL. CENTROPOMIDAE 282. E. *Ambassis gymnocephalus* SSF 163.1. E1. PEM 6839 - R. 2.6 mm OD, 43 mm SL. F. *A. natalensis* SSF 163.2. F1. PEM 6844 - L. 2.0 mm OD, 66 mm SL. F2. PEM 2162 - L. 2.8 mm OD, 66 mm TL. F3. PEM 0833 - R. 2.85 mm OD, 72 mm TL. G. *A. productus* SSF 163.3. G1. PEM 6848 - L. 4.2 mm OD, 69 mm SL. Scale bars 1 mm (—).



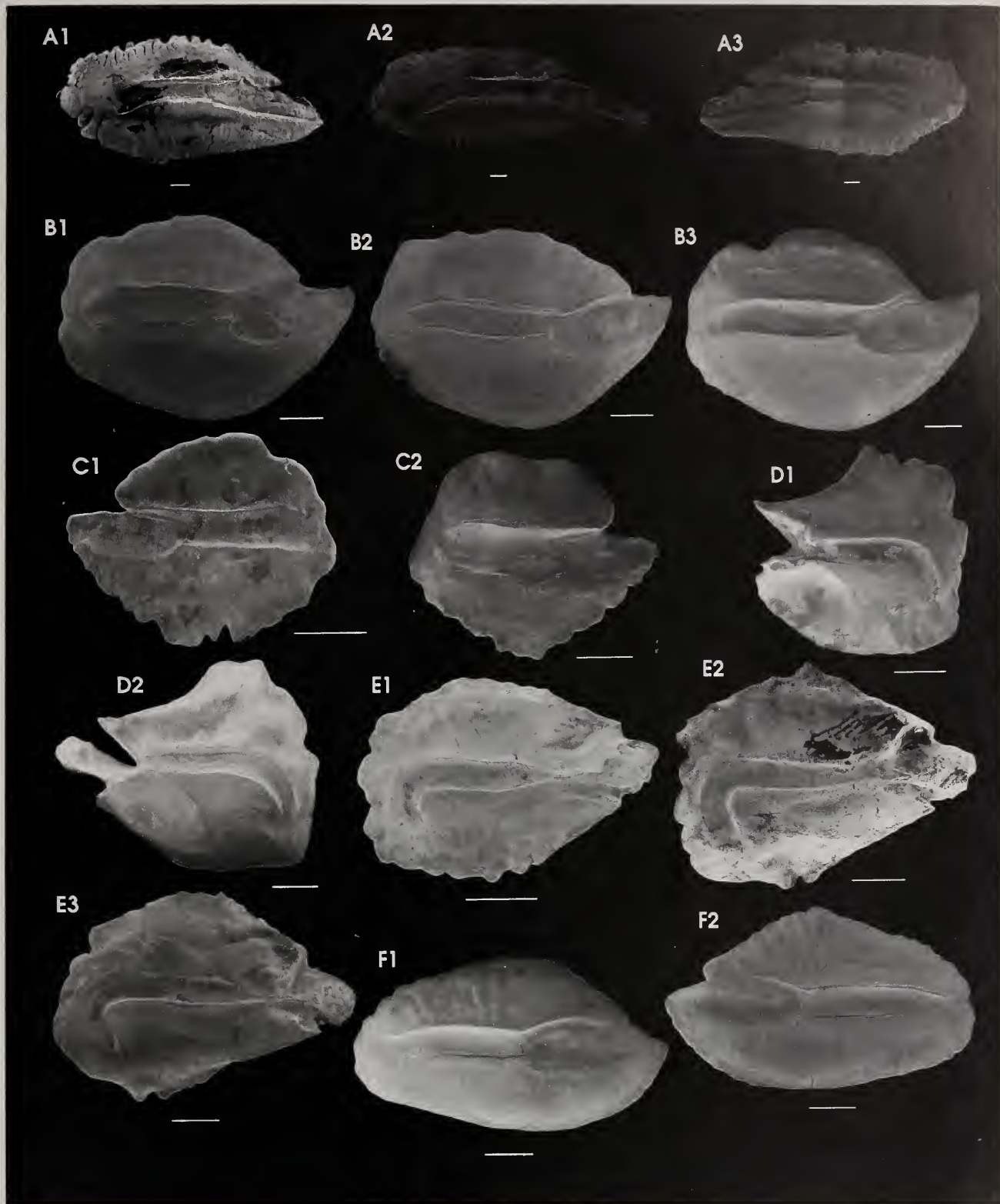


Plate 56. PERCICHTHYIDAE 283. A. *Polyprion americanus* SSF 165.1. A1. PEM 12638 - L. 15.0 mm OD, 530 mm TL. A2. PEM 12092 - L. 18.7 mm OD, 670 mm TL. A3. PEM 10363 - R. 20.1 mm OD, 805 mm TL. B. *Acropoma japonicum* SSF 176.1. B1. PEM 13064 - L. 5.1 mm OD, 88 mm TL. B2. PEM 12995 (RUSI 28522) - L. 7.1 mm OD, 120 mm TL. B3. PEM 12963 (RUSI 28369) - L. 8.1 mm OD, 136 mm TL. C. *Howella sherborni* SSF 176.2. C1. PEM 14331 - R. 4.0 mm OD, 105 mm TL. C2. PEM 13247 - L. 4.3 mm OD, 113 mm TL. D. *Neoscombrops annectens* SSF 176.3. D1. PEM 11350 (RUSI 28367) - R. 5.5 mm OD, 140 mm TL (broken ant. colliculum). D2. PEM 12964 - R. 6.6 mm OD, 210 mm TL. E. *Synagrops japonicus* SSF 176.5. E1. PEM 11607 (RUSI 28368) - L. 4.3 mm OD, 105 mm TL. E2. PEM 14416 (RUSI 34073) - L. 5.9 mm OD, 187 mm TL. E3. PEM 14420 - L. 6.8 mm OD, 245 mm TL. F. *S. microlepis* SSF 176.6. F1. PEM 14455 (RUSI 31378) - L. 6.6 mm OD, 112 mm TL. F2. PEM 14454 (RUSI 31380) - R. 7.1 mm OD, 120 mm TL. Scale bars 1 mm (—).

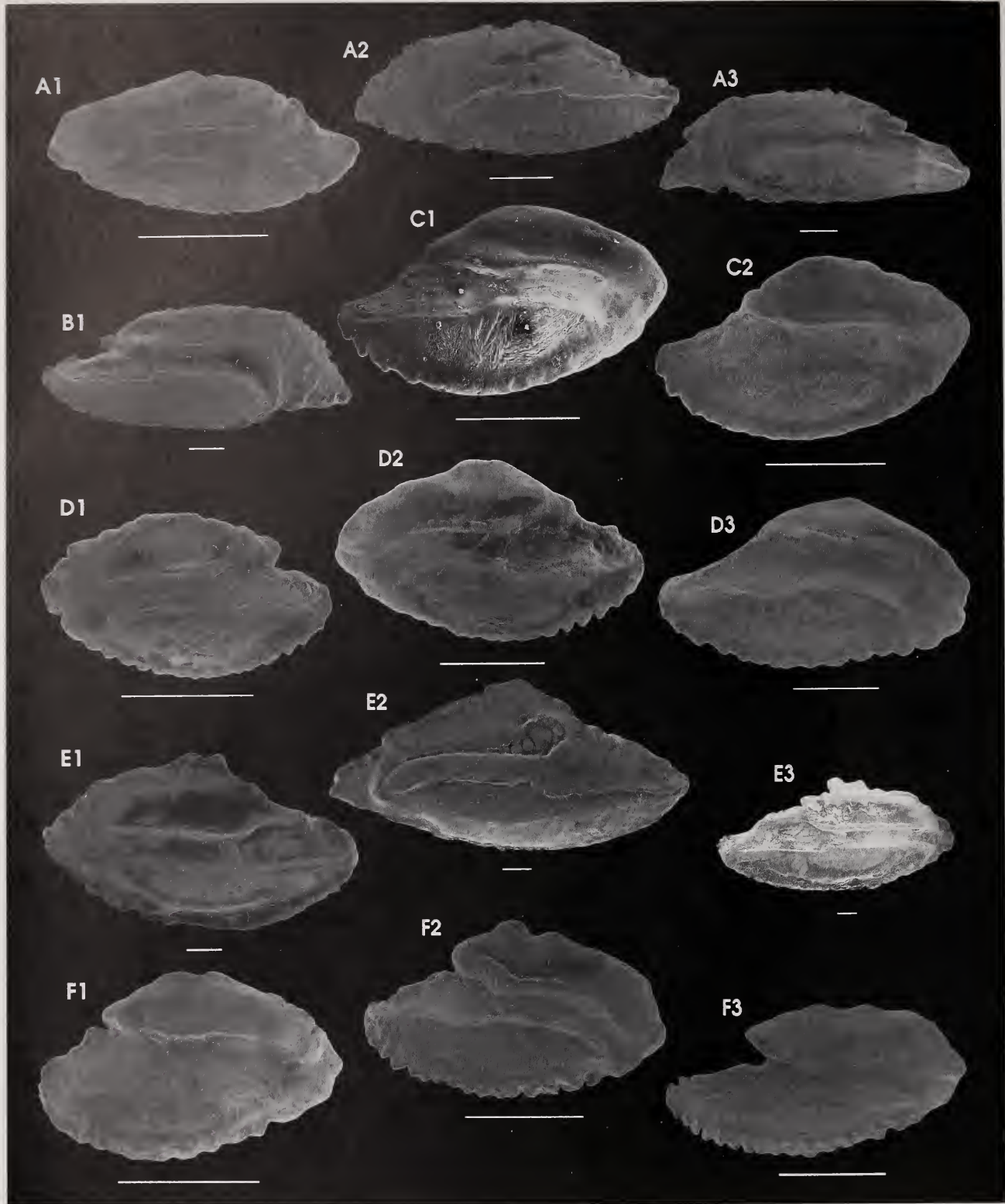


Plate 57. SERRANIDAE 284. A. *Acanthistius sebastoides* SSF 166.1. A1. PEM 5200 - L. 2.55 mm OD, 46 mm TL. A2. PEM 1877 (RUSI 9256) - L. 5.42 mm OD, 105 mm TL. A3. PEM 9799 - L. 9.0 mm OD, 185 mm TL. B. *Acanthistius* sp. SSF 166.2. B1. PEM 7758 (RUSI 28357) - R. 10.0 mm OD, 225 mm TL. C. *Anthias connelli* SSF 166.4. C1. PEM 4341 - R. 2.7 mm OD, 66 mm TL. C2. PEM 4340 - R. 2.9 mm OD, 70 mm TL. D. *A. squamipinnis* SSF 166.9. D1. PEM 2657 - L. 2.35 mm OD, 61 mm TL. D2. PEM 14252 (RUSI 35150) - L. 3.1 mm OD, 86 mm TL. D3. PEM 4373 - R. 3.7 mm OD, 111 mm TL. E. *Holanthias natalensis* SSF 166.12. E1. PEM 6489 - L. 9.5 mm OD, 240 mm TL. E2. PEM 15481 (RUSI 40619) - L. 12.82 mm OD, 469 mm TL. E3. PEM 8807 - R. 13.1 mm OD, 370 mm TL. F. *Nemanthias carberryi* SSF 166.15. F1. PEM 14241 (RUSI 30636) - R. 2.3 mm OD, 69 mm TL. F2. PEM 14238 (RUSI 30636) - R. 2.8 mm OD, 98 mm TL. F3. PEM 14239 (RUSI 30636) - R. 3.0 mm OD, 102 mm TL. Scale bars 1 mm (—).



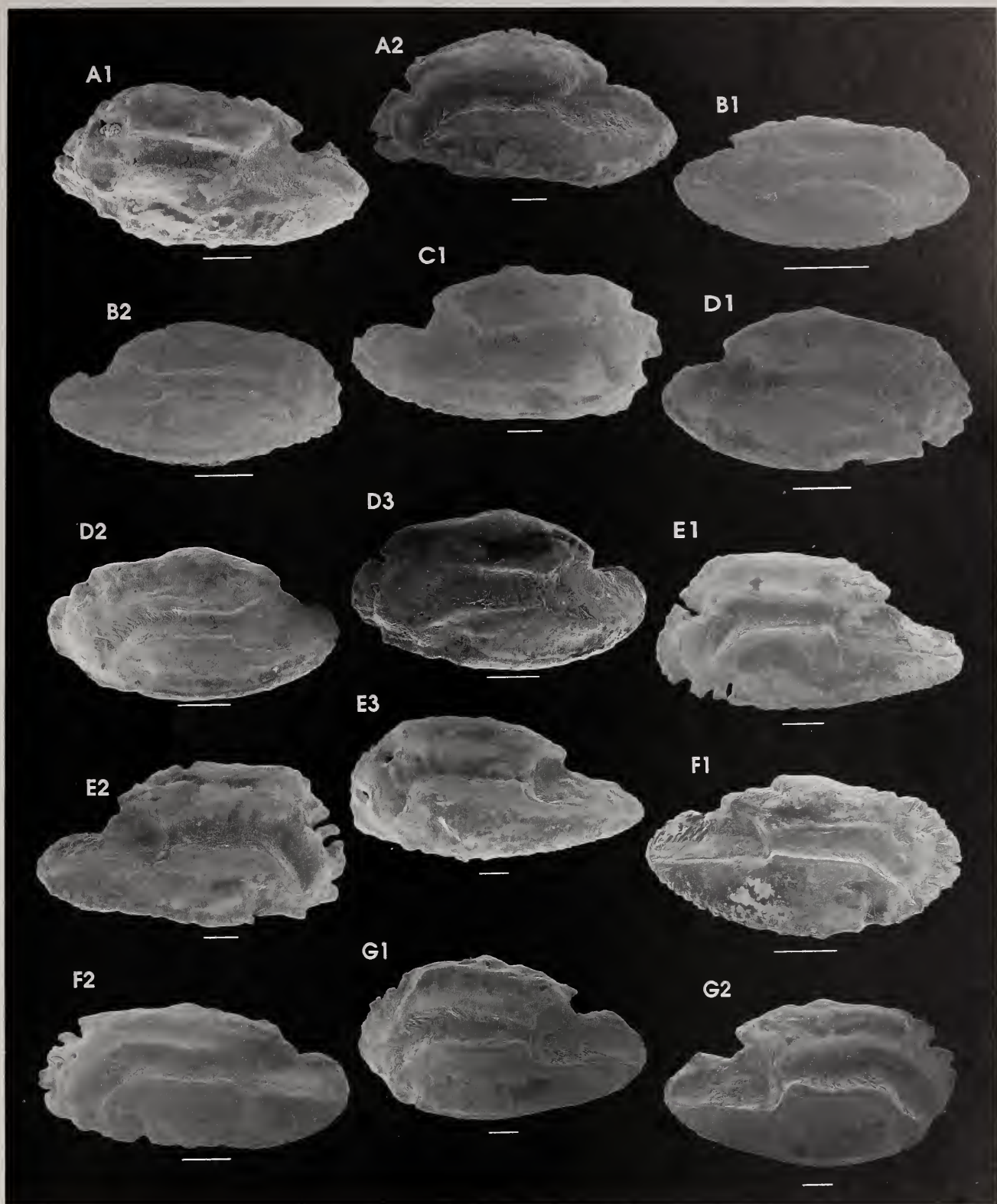


Plate 58. SERRANIDAE 284 ctd. A. *Aethaloperca rogaa* SSF 166.19. A1. PEM 2706 - L. 6.92 mm OD. A2. PEM 8311 - L. 9.3 mm OD, 430 mm TL. B. *Cephalopholis argus* SSF 166.21. B1. PEM 0870 - R. 3.55 mm OD, 115 mm TL. B2. 1089H - R. 5.54 mm OD, 95 mm TL. C. *C. aurantia* SSF 166.22. C1. PEM 14536 (RUSI 31433) - R. 9.8 mm OD, 228 mm TL. D. *C. leopardus* SSF 166.25. D1. PEM 14280 (RUSI 28236) - R. 5.8 mm OD, 125 mm TL. D2. PEM 15638 - L. 5.84 mm OD, 125 mm TL. D3. PEM 15625 - L. 5.96 mm OD, 125 mm TL. E. *C. miniata* SSF 166.26. E1. PEM 2753 - L. 8.52 mm OD, 258 mm TL. E2. PEM 8312 - R. 10.3 mm OD, 370 mm TL. E3. PEM 8367 - L. 11.6 mm OD, 372 mm TL. F. *C. nigripinnis* SSF 166.27. F1. PEM 8212 (RUSI 30391) - R. 5.0 mm OD, 132 mm TL. F2. PEM 14522 (RUSI 31447) - L. 6.7 mm OD, 173 mm TL. G. *C. sexmaculata* SSF 166.28. G1. PEM 15611 - L. 10.58 mm OD, 350 mm TL. G2. PEM 15611 - R. Scale bars 1 mm (—).

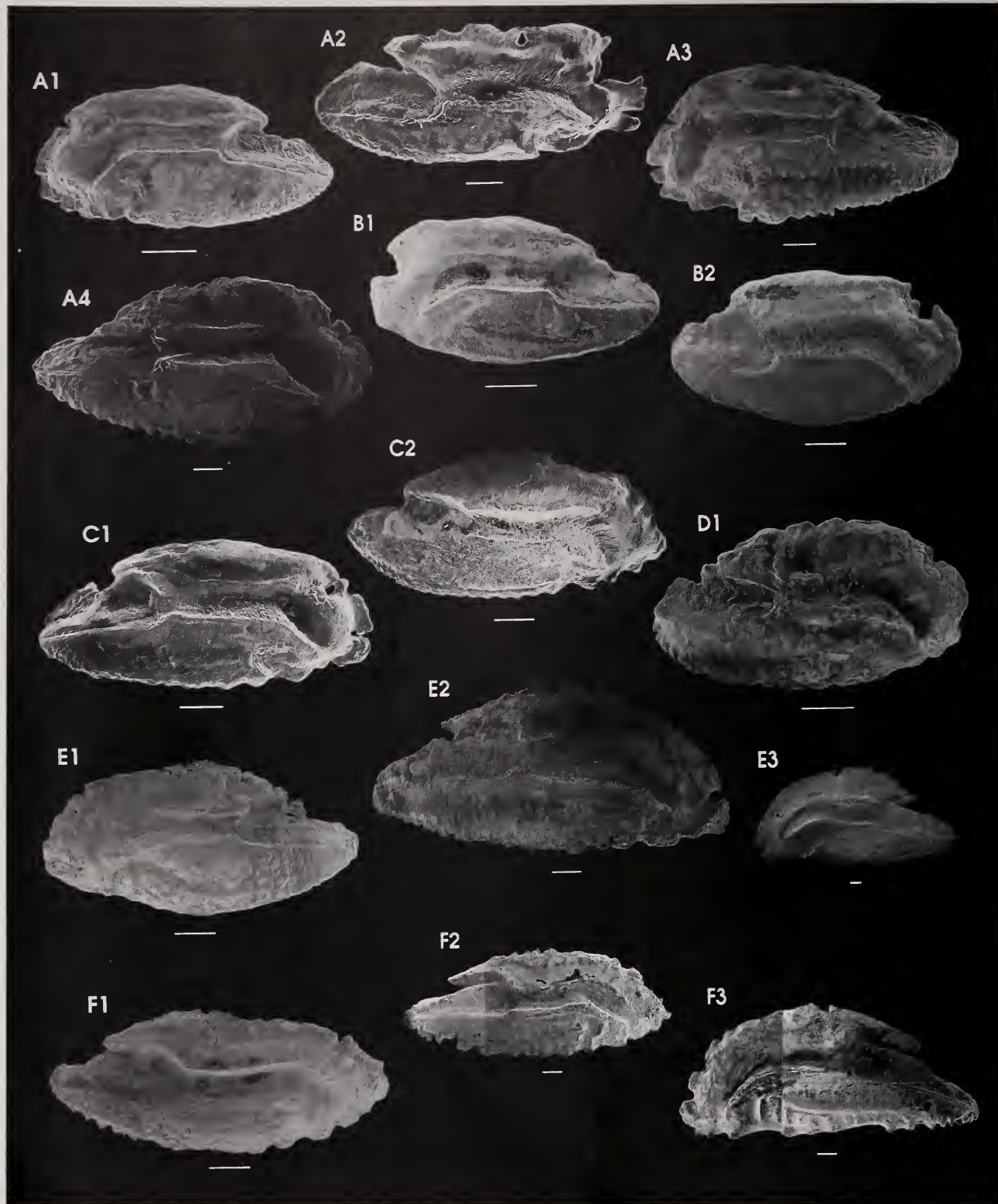


Plate 59. SERRANIDAE 284 ctd. A. *Cephalopholis sonnerati* SSF 166.29. A1. PEM 8245 (RUSI 34149) - L. 6.1 mm OD, 162 mm TL. A2. PEM 8366 (RUSI 37474) - R. 8.8 mm OD, 242 mm TL. A3. PEM 8172 - L. 10.9 mm OD, 431 mm TL. A4. PEM 8361 - R. 12.0 mm OD, 400 mm TL. B. *C. spiloparaea* SSF 166.30. B1. PEM 14250 (RUSI 28270) - L. 6.0 mm OD, 132 mm TL. B2. PEM 15784 - R. 7.66 mm OD, 170 mm TL. C. *C. urodata* SSF 166.-. C1. PEM 8401 (RUSI 34148) - R. 7.7 mm OD, 225 mm TL. C2. PEM 8199 (RUSI 37506) - R. 8.1 mm OD, 233 mm TL. D. *Cromileptes altivelis* SSF 166.31. D1. PEM 11297 - R. 6.4 mm OD, 222 mm TL. E. *Epinephelus albomarginatus* SSF 166.33. E1. PEM 6545 (RUSI 19373) - L. 8.4 mm OD, 173 mm TL. E2. PEM 0747 - R. 13.58 mm OD, 500 mm TL. E3. PEM 6221 - L. 20.0 mm OD, 695 mm TL. F. *E. andersoni* SSF 166.34. F1. PEM 8578 (RUSI 37472) - R. 9.5 mm OD, 260 mm TL. F2. PEM 10353 - R. 14.0 mm OD, 482 mm TL. F3. PEM 6336 - L. 16.4 mm OD, 662 mm TL. Scale bars 1 mm (—).



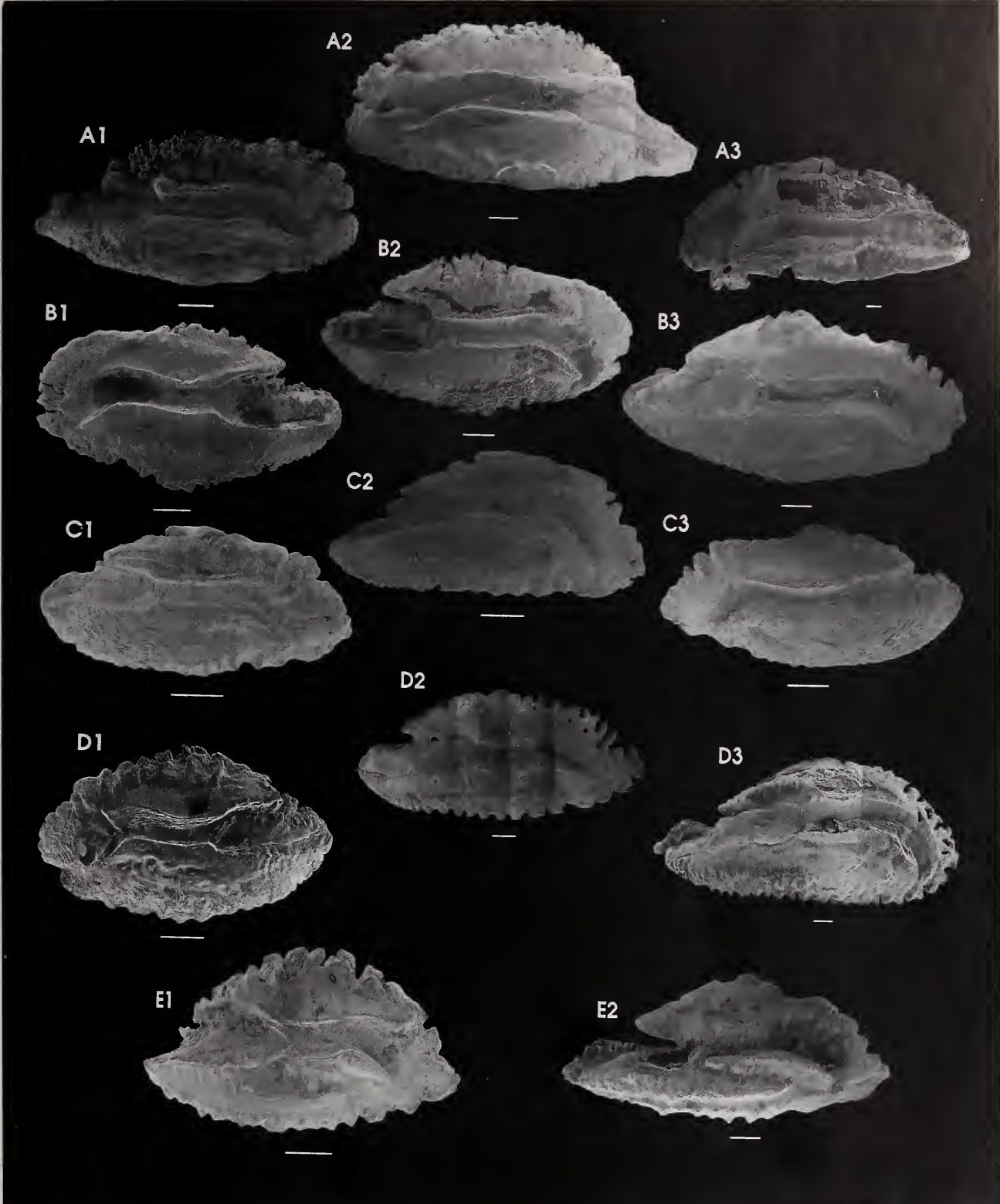


Plate 60. SERRANIDAE 284 ctd. A. *Epinephelus chabaudi* SSF 166.37. A1. PEM 0173 (RUSI 03587) - R. 10.5 mm OD, 245 mm TL. A2. PEM 10364 - L. 13.2 mm OD, 388 mm TL. A3. PEM 8564 - L. 20.4 mm OD, 755 mm TL. B. *E. chlorostigma* SSF 166.38. B1. PEM 6178 - L. 8.6 mm OD, 250 mm TL. B2. PEM 2701 - R. 10.24 mm OD. B3. PEM 6177 - R. 12.0 mm OD, 365 mm TL. C. *E. fasciatus* SSF 166.39. C1. PEM 14570 (RUSI 31409) - R. 6.6 mm OD, 182 mm TL. C2. PEM 14573 - R. 8.2 mm OD, 252 mm TL. C3. PEM 14527 (RUSI 31438) - L. 8.3 mm OD, 247 mm TL. D. *E. flavocaeruleus* SSF 166.41. D1. PEM 15440 (RUSI 40609) - L. 7.22 mm OD, 263 mm TL. D2. PEM 15072 - R. 13.0 mm OD, 650 mm TL. D3. PEM 2850 - R. 16.34 mm OD, 835 mm TL. E. *E. hexagonatus* SSF 166.44. E1. PEM 8534 - R. 7.5 mm OD, 325 mm TL. E2. PEM 8547 - R. 11.9 mm OD, 515 mm TL. Scale bars 1 mm (—).

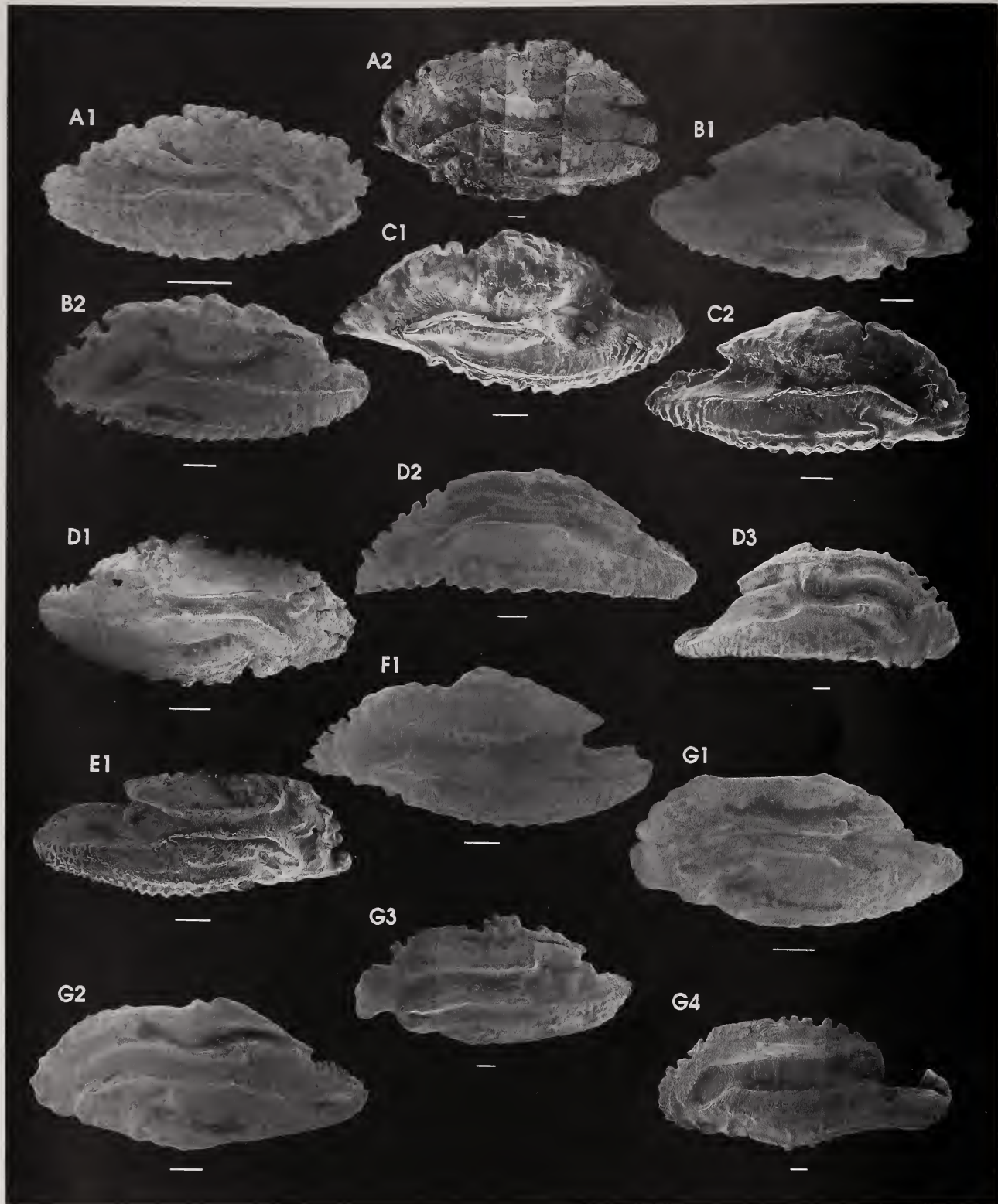


Plate 61. SERRANIDAE 284 ctd. A. *Epinephelus lanceolatus* SSF 166.45. A1. PEM 9328 - R. 5.1 mm OD, 122 mm TL. A2. PEM 0077 - L. 17.88 mm OD. B. *E. longispinis* SSF 166.46. B1. PEM 5671 - R. 10.5 mm OD, 405 mm TL. B2. PEM 15769 - L. 10.76 mm OD, 380 mm TL. C. *E. macrospilos* SSF 166.40. C1. PEM 2704 - L. 10.52 mm OD. C2. PEM 2780 - R. 10.72 mm OD. D. *E. marginatus* SSF 166.43. D1. PEM 15480 (RUSI 40597) - R. 8.36 mm OD, 242 mm TL. D2. PEM 5731 - L. 12.4 mm OD, 378 mm TL. D3. PEM 6381 - R. 18.0 mm OD, 755 mm TL. E. *E. melanostigma* SSF 166.49. E1. PEM 15399 (RUSI 40602) - R. 9.82 mm OD, 329 mm TL. F. *E. merra* SSF 166.50. F1. PEM 14574 - L. 10.2 mm OD, 495 mm TL. G. *E. morrhua* SSF 166.53. G1. PEM 7716 (RUSI 20109) - L. 8.7 mm OD, 200 mm TL. G2. PEM 15614 - L. 11.34 mm OD, 305 mm TL. G3. PEM 15603 - L. 15.68 mm OD, 510 mm TL. G4. 1584H - L. 17.8 mm OD, 520 mm SL. Scale bars 1 mm (—).



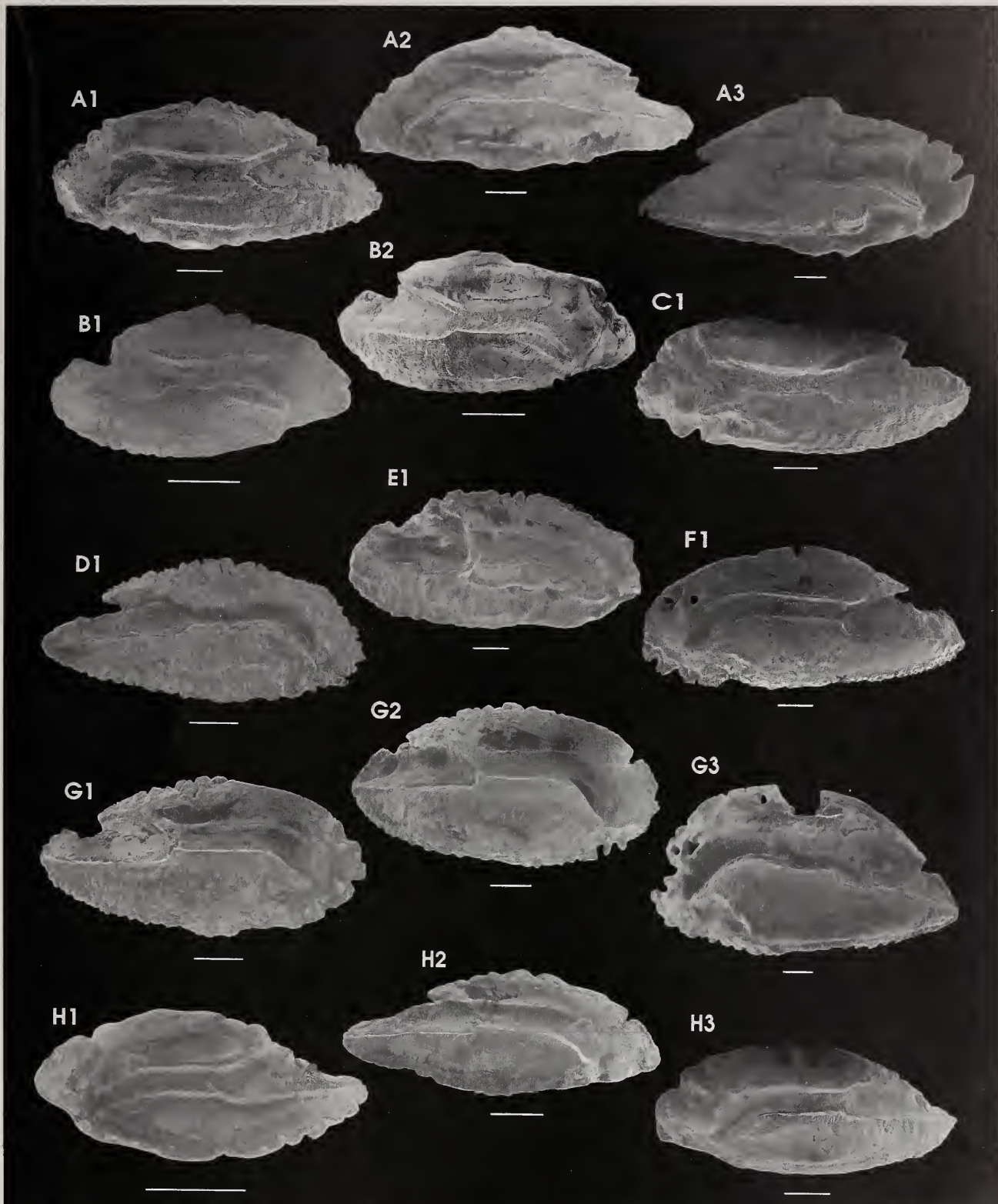


Plate 62. SERRANIDAE 284 ctd. A. *Epinephelus rivulatus* SSF 166.60. A1. PEM 6162 (RUSI 17176) - L. 7.7 mm OD, 237 mm TL. A2. PEM 6732 - L. 8.6 mm OD, 280 mm TL. A3. PEM 6304 - R. 10.6 mm OD, 325 mm TL. B. *E. spilotoceps* SSF 166.63. B1. PEM 14545 (RUSI 31388) - R. 4.4 mm OD, 114 mm TL. B2. PEM 14544 (RUSI 31382) - R. 5.0 mm OD, 141 mm TL. C. *E. tauvina* SSF 166.65. C1. PEM 15682 (RUSI 41959) - L. 8.72 mm OD, 343 mm TL. D. *E. tukula* SSF 166.66. D1. PEM 8813 (RUSI 37483) - R. 7.1 mm OD, 245 mm TL. E. *Plectropomus* sp. SSF 166.-. E1. 1347H - R. 8.78 mm OD, 468 mm TL. F. *Variola albinarginata* SSF 166.74. F1. PEM 15674 - L. 9.82 mm OD, 370 mm TL. G. *V. louti* SSF 166.75. G1. PEM 8545 - R. 6.7 mm OD, 215 mm TL. G2. PEM 8158 - R. 8.3 mm OD, 340 mm TL. G3. PEM 8374 - L. 11.3 mm OD, 645 mm TL. H. *Serranus cabrilla* SSF 166.76. H1. PEM 5627 - L. 3.35 mm OD, 83 mm TL. H2. PEM 6546 - R. 6.5 mm OD, 149 mm TL. H3. PEM 15008 (RUSI 35582) - L. 6.6 mm OD, 162 mm TL. Scale bars 1 mm (—).

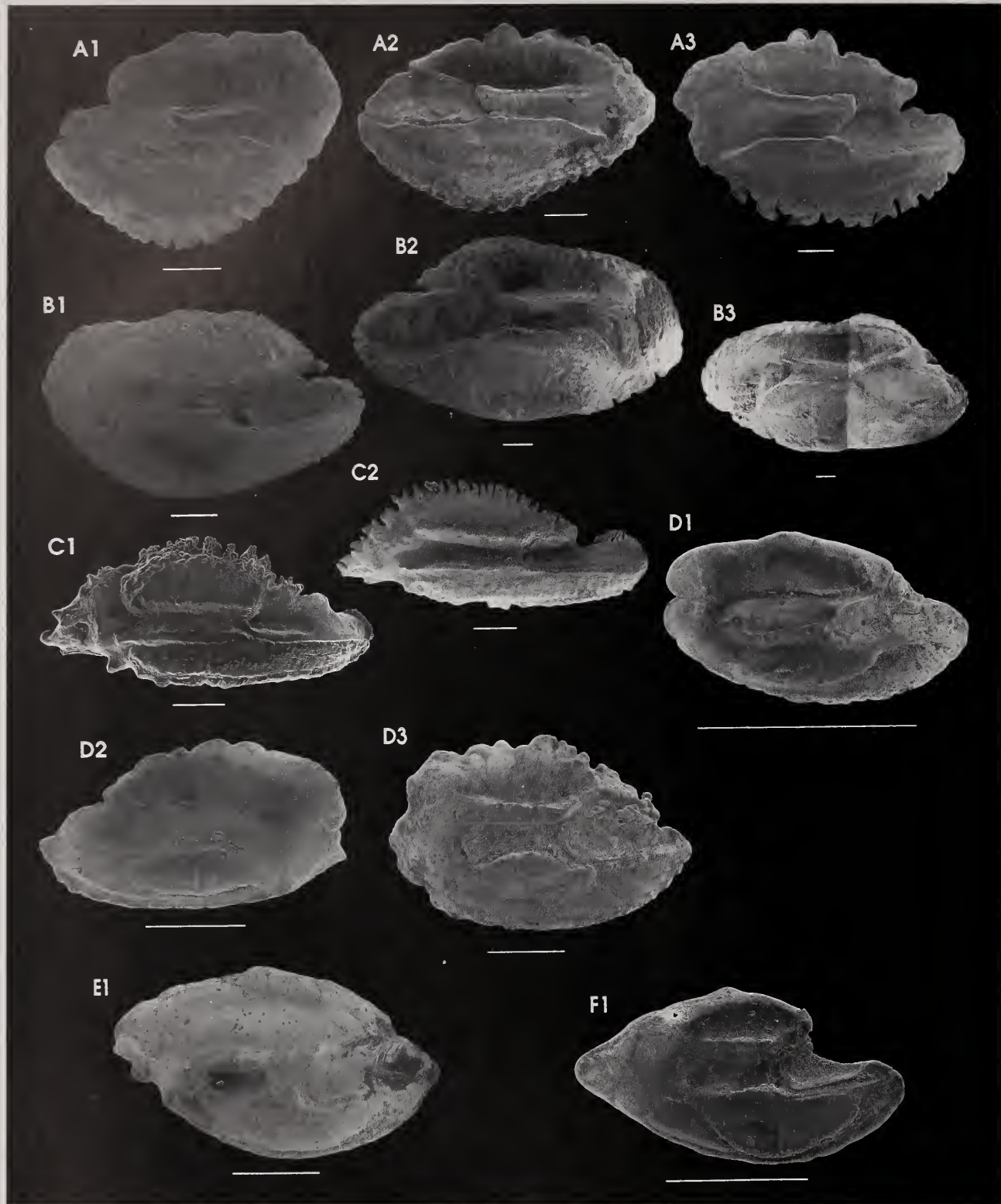


Plate 63. SERRANIDAE 284 ctd. A. *Callantheas legras* SSF 168.1. A1. PEM 14436 - R. 5.7 mm OD, 171 mm TL. A2. PEM 14432 (RUSI 28355) - R. 7.4 mm OD, 220 mm TL. A3. PEM 14433 - L. 9.0 mm OD, 295 mm TL. B. *Dinoperca petersi* SSF 180.1. B1. PEM 8735 - L. 7.2 mm OD, 165 mm TL. B2. PEM 11990 - R. 12.0 mm OD, 345 mm TL. B3. PEM 15155 - L. 14.68 mm OD, 483 mm TL. GRAMMISTIDAE 285. C. *Aulacocephalus temmincki* SSF 167.1. C1. PEM 15469 (RUSI 40596) - L. 6.68 mm OD, 216 mm TL. C2. PEM 5984 - L. 7.3 mm OD, 260 mm TL. D. *Grammistes sexlineatus* SSF 167.3. D1. PEM 8413 (RUSI 34117) - L. 2.0 mm OD, 37 mm TL. D2. PEM 5979 - R. 3.1 mm OD, 132 mm TL. D3. PEM 8348 - L. 4.1 mm OD, 185 mm TL. E. *Aporops allfreei* SSF 171.1. E1. PEM 14270 (RUSI 31128) - L. 4.0 mm OD, 92 mm TL. F. *Pseudogramma polyacantha* SSF 171.2. F1. PEM 2770 - L. 2.35 mm OD, 48 mm TL. Scale bars 1 mm (—).



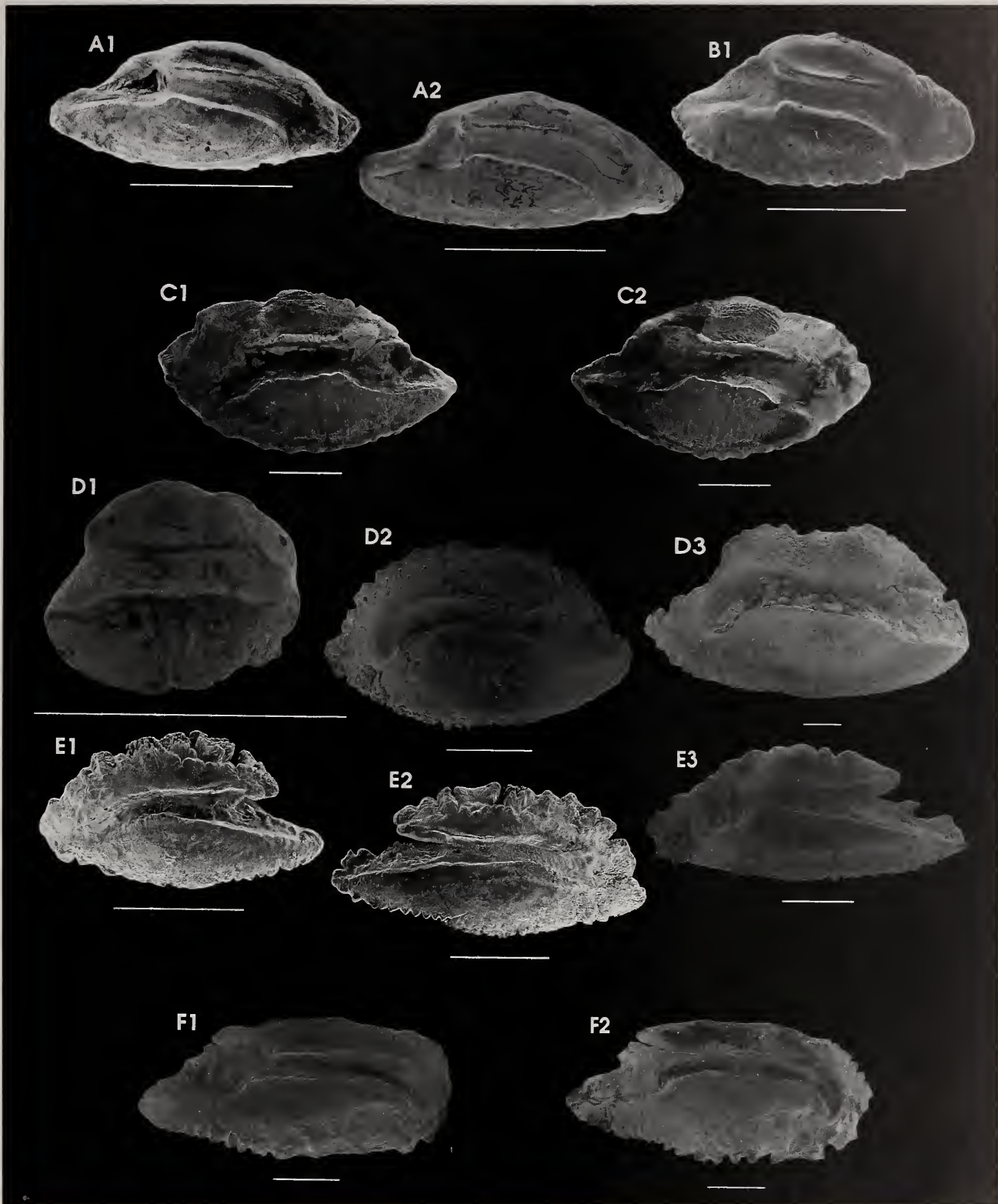


Plate 64. PSEUDOCROMIDAE 286. A. *Pseudochromis dutoiti* SSF 169.4. A1. PEM 2858 - R. 1.95 mm OD, 60 mm TL. A2. 0696H - R. 2.15 mm OD, 60 mm TL. B. *P. melas* SSF 169.5. B1. PEM 4617 - R. 2.45 mm OD, 86 mm TL. PLESIOPIDAE 288. C. *Callopleysiops altivelis* SSF 172.1. C1. PEM 15636 - L. 4.35 mm OD, 74 mm SL. C2. PEM 15636 - R. TERAPONIDAE 291. D. *Terapon jarbua* SSF 173.2. D1. PEM 2834 - R. 0.8 mm OD, 24 mm TL. D2. PEM 2830 - L. 3.7 mm OD, 101 mm TL. D3. PEM 2341 - L. 9.36 mm OD, 307 mm TL. E. *T. theraps* SSF 173.3. E1. PEM 15293 (RUSI 36876) - L. 2.5 mm OD, 77 mm TL. E2. PEM 15292 (RUSI 36876) - R. 3.6 mm OD, 109 mm TL. E3. PEM 1693 - L. 4.6 mm OD, 150 mm TL. KUHLIIDAE 293. F. *Kuhlia mugil* SSF 164.1. F1. PEM 14584 (RUSI 31441) - R. 5.4 mm OD, 160 mm TL. F2. PEM 7441 - R. 5.5 mm OD, 187 mm TL. Scale bars 1 mm (—).

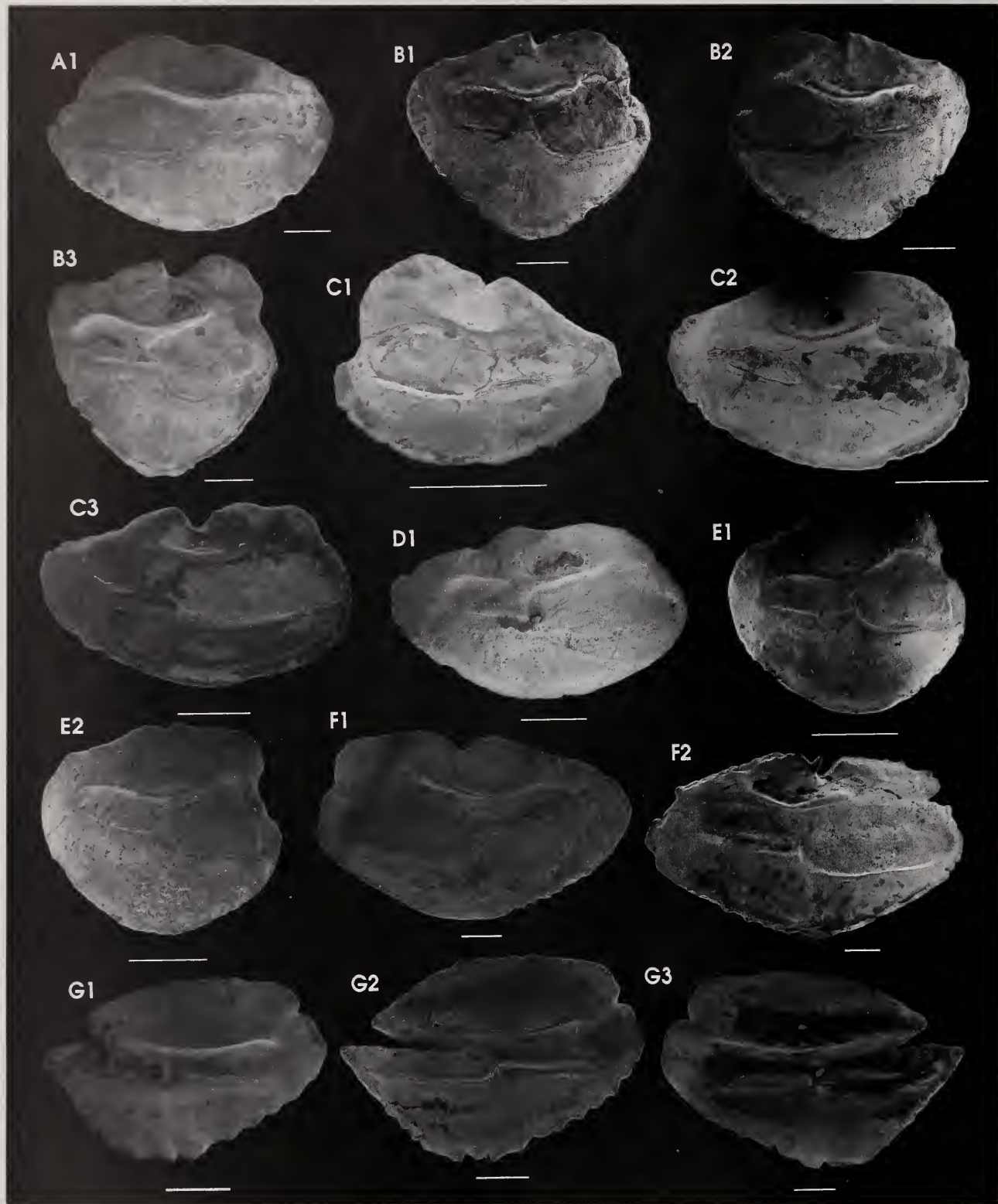


Plate 67. APOGONIDAE 297 ctd. A. *Apogon quadrifasciatus* SSF 175.20. A1. PEM 0230 - R. 6.76 mm OD, 92 mm TL. B. *A. savayensis* SSF 175.22. B1. PEM 15645 - L. 4.98 mm OD, 83 mm TL. B2. PEM 15645 - R. B3. 0986H - L. 5.0 mm OD, 89 mm TL. C. *A. semiornatus* SSF 175.23. C1. PEM 8435 - R. 2.2 mm OD, 31 mm TL. C2. PEM 8412 (RUSI 34112) - L. 3.5 mm OD, 47 mm TL. C3. PEM 3883 - L. 4.35 mm OD, 67 mm TL. D. *A. taeniophorus* SSF 175.25. D1. 1379H - L. 4.55 mm OD, 60 mm SL. E. *Archamia fucata* SSF 175.30. E1. PEM 15700 (RUSI 42658) - L. 2.95 mm OD, 52 mm TL. E2. PEM 15701 (RUSI 42658) - L. 3.35 mm OD, 54 mm TL. F. *Cheilodipterus lineatus* SSF 175.36. F1. PEM 14795 (RUSI 31412) - R. 8.4 mm OD, 138 mm SL. F2. PEM 15781 - L. 9.45 mm OD, 200 mm TL. G. *Epigonus denticulatus* SSF 175.45. G1. PEM 14707 - R. 4.6 mm OD, 93 mm TL. G2. PEM 14746 (RUSI 31379) - R. 6.5 mm OD, 137 mm TL. G3. PEM 14151 (RUSI 28362) - L. 7.8 mm OD, 164 mm TL. Scale bars 1 mm (—).



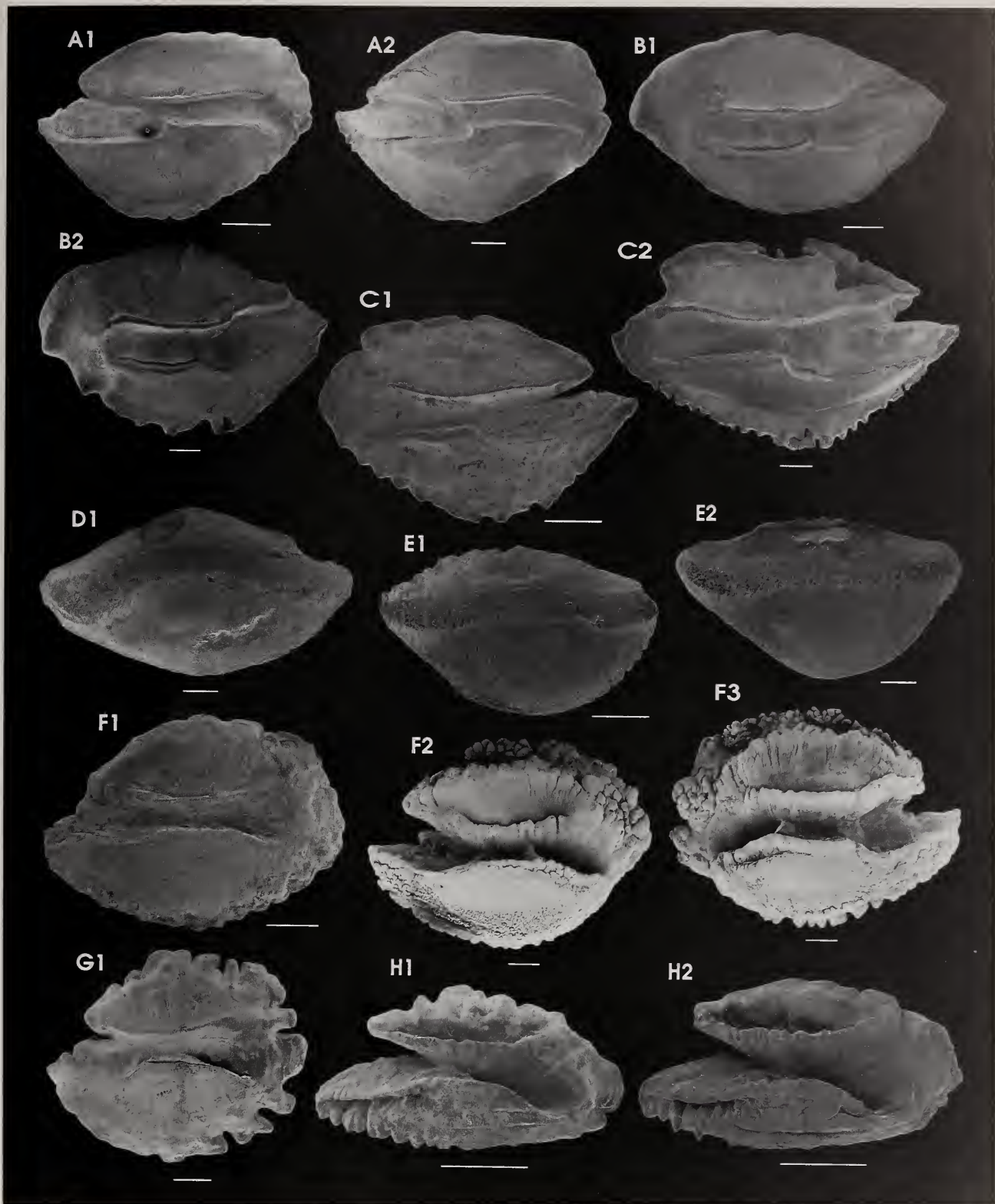


Plate 68. APOGONIDAE 297 ctd. A. *Epigonus* cf. *robustus* A. SSF 175.47A. A1. PEM 14958 (RUSI 35606) - R. 6.2 mm OD, 138 mm TL. A2. PEM 14953 (RUSI 35606) - R. 8.6 mm OD, 194 mm TL. B. *Epigonus* cf. *robustus* B. SSF 175.47B. B1. PEM 13418 - L. 8.1 mm OD, 195 mm TL. B2. PEM 14606 - L. 9.7 mm OD, 216 mm TL. C. *E. telescopus* SSF 175.48. C1. 1514H - L. 5.68 mm OD, 125 mm TL. C2. 1513H - L. 11.0 mm OD, 235 mm TL. SILLAGINIDAE 299. D. *Sillago chondropus* SSF 198.1. D1. PEM 6000 - L. 10.0 mm OD, 352 mm TL. E. *S. sihama* SSF 198.3. E1. PEM 4347 - L. 4.95 mm OD, 101 mm TL. E2. PEM 8250 (RUSI 34083) - L. 9.2 mm OD, 212 mm TL. MALACANTHIDAE 300. F. *Branchiostegus doliatus* SSF 197.1. F1. PEM 8827 (RUSI 37425) - R. 5.9 mm OD, 186 mm TL. F2. PEM 14978 (RUSI 35547) - R. 9.7 mm OD, 373 mm TL. F3. PEM 14979 (RUSI 35548) - L. 10.4 mm OD, 381 mm TL. G. *B. sawakinensis* SSF 197.2. G1. PEM 5977 - R. 7.5 mm OD, 281 mm TL. H. *Malacanthus brevirostris* SSF 197.4. H1. PEM 6756 (RUSI 28363) - R. 3.2 mm OD, 220 mm TL. H2. PEM 5983 - R. 3.5 mm OD, 219 mm TL. Scale bars 1 mm (—).

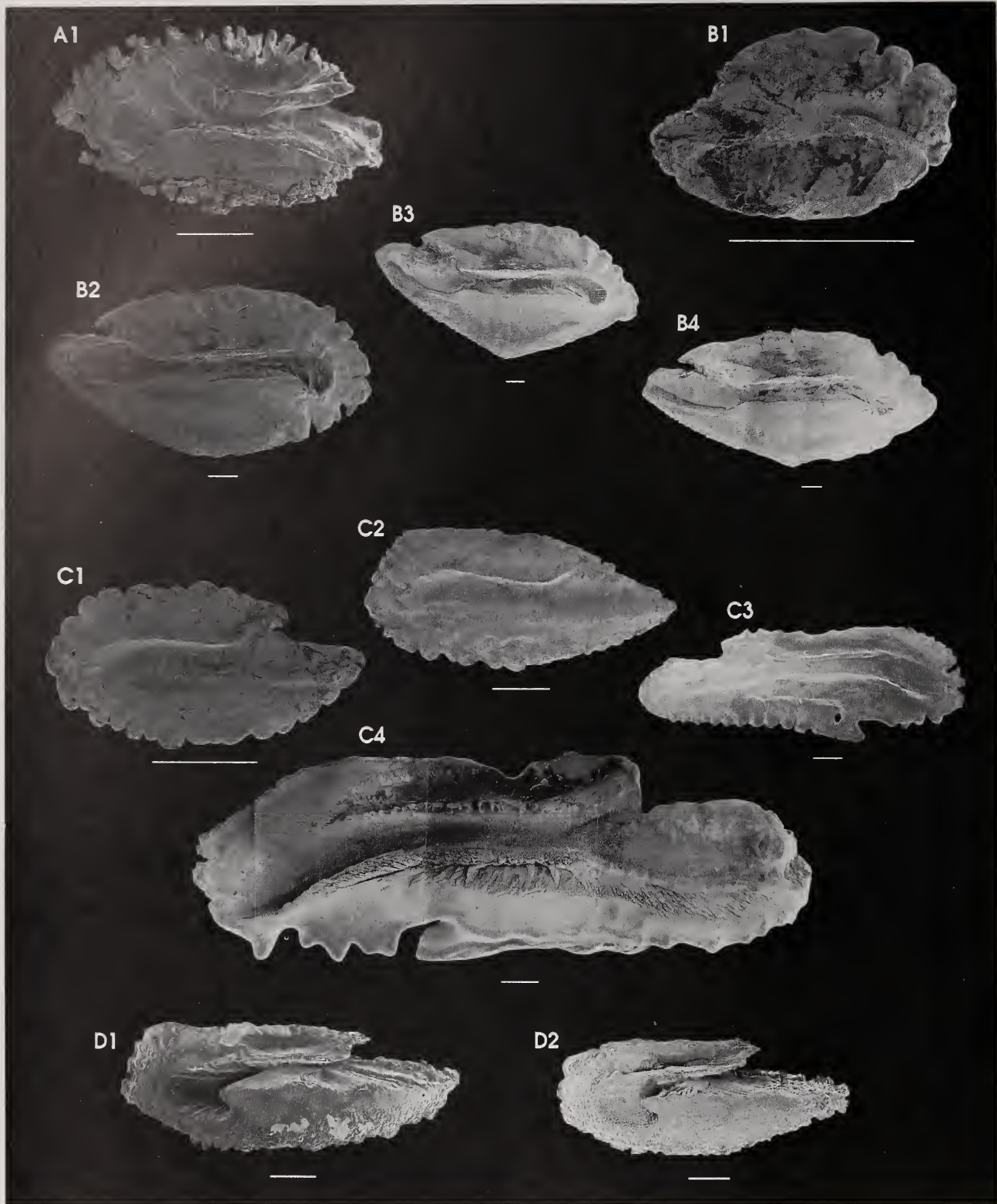


Plate 69. MALACANTHIDAE 300 etd. A. *Malacanthus latovittatus* SSF 197.5. A1. PEM 15479 (RUSI 40624) - L. 4.35 mm OD, 347 mm TL. POMATOMIDAE 303. B. *Scombrops boops* SSF 177.1. B1. PEM 2568 - R. 1.7 mm OD, 34 mm TL. B2. PEM 12561 - R. 12.6 mm OD, 311 mm TL. B3. PEM 12637 - R. 15.1 mm OD, 400 mm TL. B4. PEM 15030 (RUSI 35542) - R. 15.8 mm OD, 467 mm TL. C. *Pomatomus saltatrix* SSF 178.1. C1. PEM 4327 (RUSI 13267) - L. 3.06 mm OD, 59 mm TL. C2. PEM 3586 (RUSI 11933) - L. 5.55 mm OD, 146 mm TL. C3. PEM 1852 - R. 12.0 mm OD, 417 mm TL. C4. PEM 6039 - L. 17.1 mm OD, 1080 mm TL. RACHYCENTRIDAE 304. D. *Rachycentron canadum* SSF 212.1. D1. PEM 2699 - L. 7.14 mm OD, 845 mm TL. D2. PEM 3870 - L. 7.8 mm OD, 844 mm TL. Scale bars 1 mm (—).



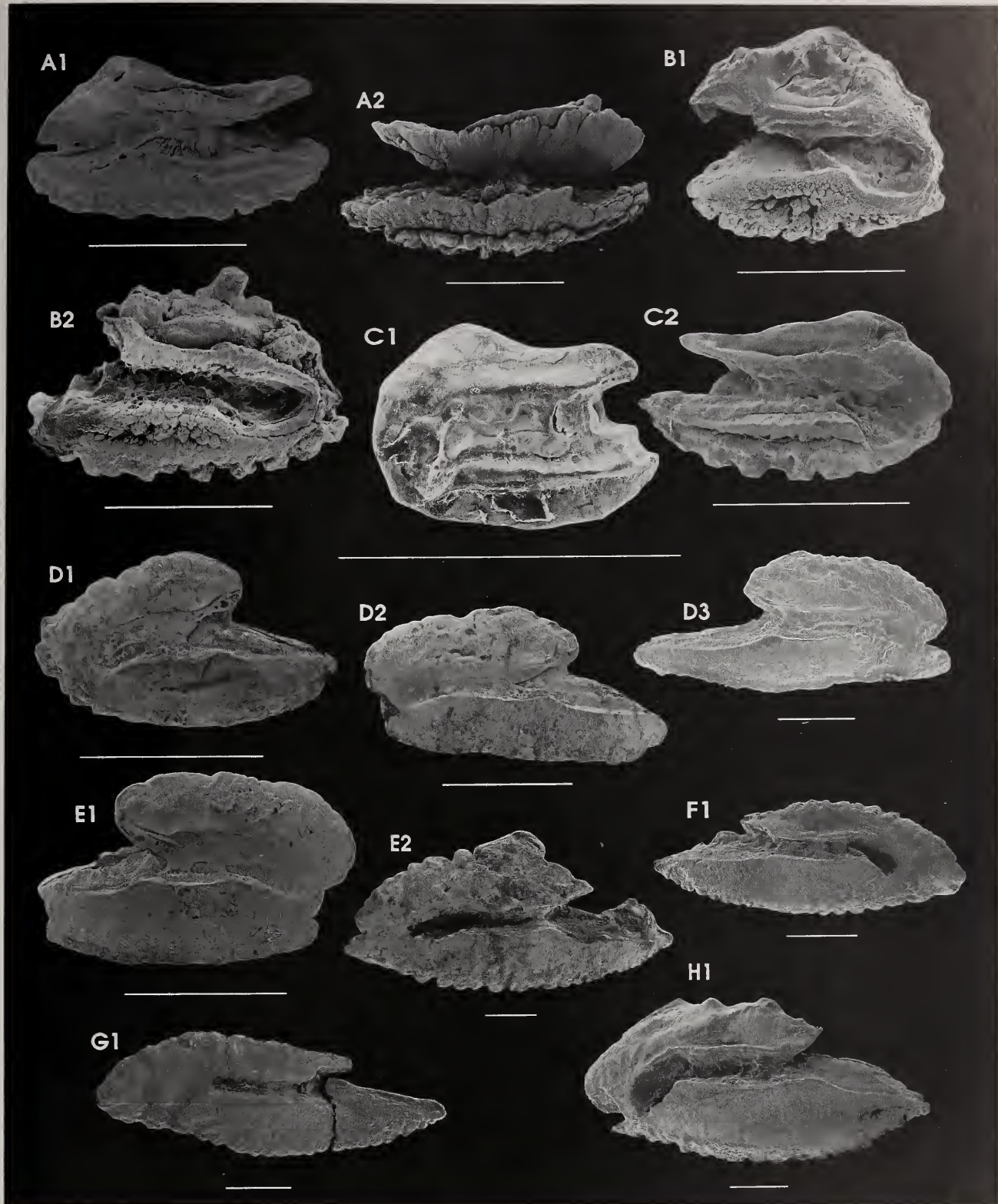


Plate 70. ECHENEIDIDAE 305. A. *Echeneis naucrates* SSF 213.1. A1. 0730H - L. 1.95 mm OD, 550 mm TL. A2. PEM 8495 - R. 2.8 mm OD, 735 mm TL. B. *Remora brachyptera* SSF 213.4. B1. PEM 14808 (RUSI 30395) - R. 1.7 mm OD, 140 mm TL. B2. PEM 14807 (RUSI 30395) - R. 2.2 mm OD, 173 mm TL. C. *R. remora* SSF 213.5. C1. PEM 14837 (RUSI 37088) - L. 0.9 mm OD, 88 mm TL. C2. PEM 0035 - R. 1.6 mm OD. CARANGIDAE 306. D. *Alectis ciliaris* SSF 210.1. D1. PEM 13442 - L. 1.7 mm OD, 73 mm TL. D2. PEM 6757 (RUSI 28388) - L. 2.6 mm OD, 100 mm TL. D3. PEM 15471 (RUSI 40622) - R. 4.2 mm OD, 246 mm TL. E. *A. indicus* SSF 210.2. E1. PEM 12446 - R. 2.45 mm OD, 127 mm TL. E2. PEM 6760 - L. 6.0 mm OD, 345 mm TL. F. *Alepes djedaba* SSF 210.3. F1. PEM 6717 (RUSI 28387) - R. 4.4 mm OD, 162 mm TL. G. *Atule mate* SSF 210.4. G1. PEM 0404 - L. 5.22 mm OD, 218 mm TL. H. *Carangoides caeruleopinnatus* SSF 210.6. H1. PEM 8620 - L. 5.9 mm OD, 317 mm TL. Scale bars 1 mm (—).



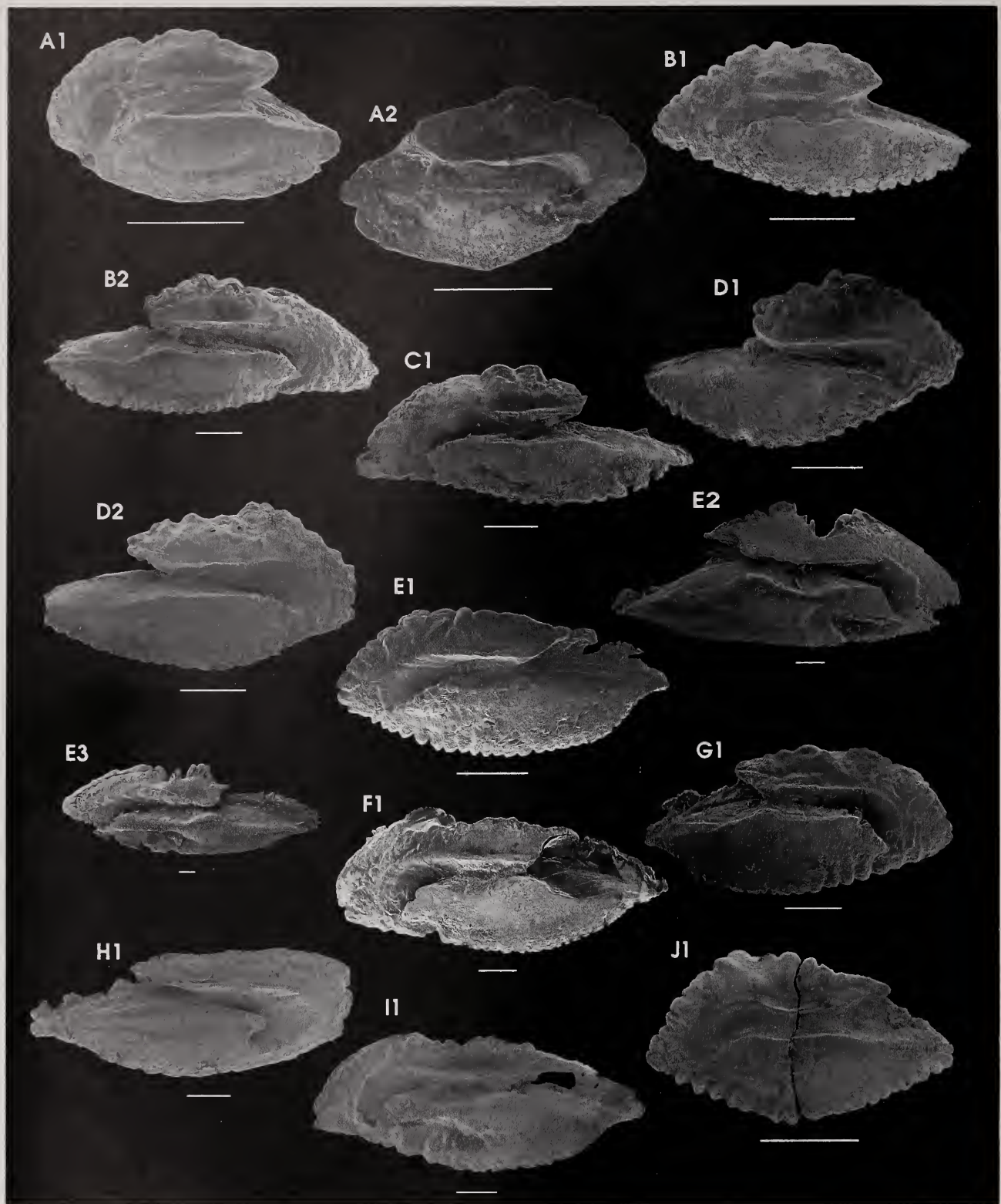


Plate 71. CARANGIDAE 306 ctd. A. *Carangoides equula* SSF 210.9. A1. PEM 14380 (RUSI 34130) - L. 2.7 mm OD, 101 mm TL. A2. PEM 12569 (RUSI 28370) - R. 2.8 mm OD, 106 mm TL. B. *C. fulvoguttatus* SSF 210.11. B1. PEM 0359 - L. 3.85 mm OD, 160 mm TL. B2. PEM 0451 - R. 7.44 mm OD, 490 mm TL. C. *C. gymnostethus* SSF 210.12. C1. PEM 9584 - L. 5.6 mm OD, 345 mm TL. D. *C. malabaricus* SSF 210.14. D1. PEM 3933 - R. 4.65 mm OD, 192 mm TL. D2. PEM 3931 - R. c.5.16 mm OD, 219 mm TL. E. *Caranx ignobilis* SSF 210.17. E1. PEM 15450 (RUSI 40568) - L. 4.75 mm OD, 207 mm TL. E2. PEM 7451 - R. 12.8 mm OD, 870 mm TL. E3. PEM 7443 - L. 17.2 mm OD, 1315 mm TL. F. *C. melampygus* SSF 210.19. F1. PEM 2724 - L. 9.58 mm OD, 534 mm TL. G. *C. papuensis* SSF 210.20. G1. PEM 0397 - R. 5.78 mm OD, 247 mm TL. H. *C. sem* SSF 210.21. H1. PEM 0636 - R. 7.66 mm OD, 620 mm TL. I. *C. sexfasciatus* SSF 210.22. I1. PEM 10485 - L. 8.5 mm OD, 513 mm TL. J. *Chloroscombrus chrysurus* SSF 210.24. J1. PEM 0376 - L. 3.2 mm OD. Scale bars 1 mm (—).



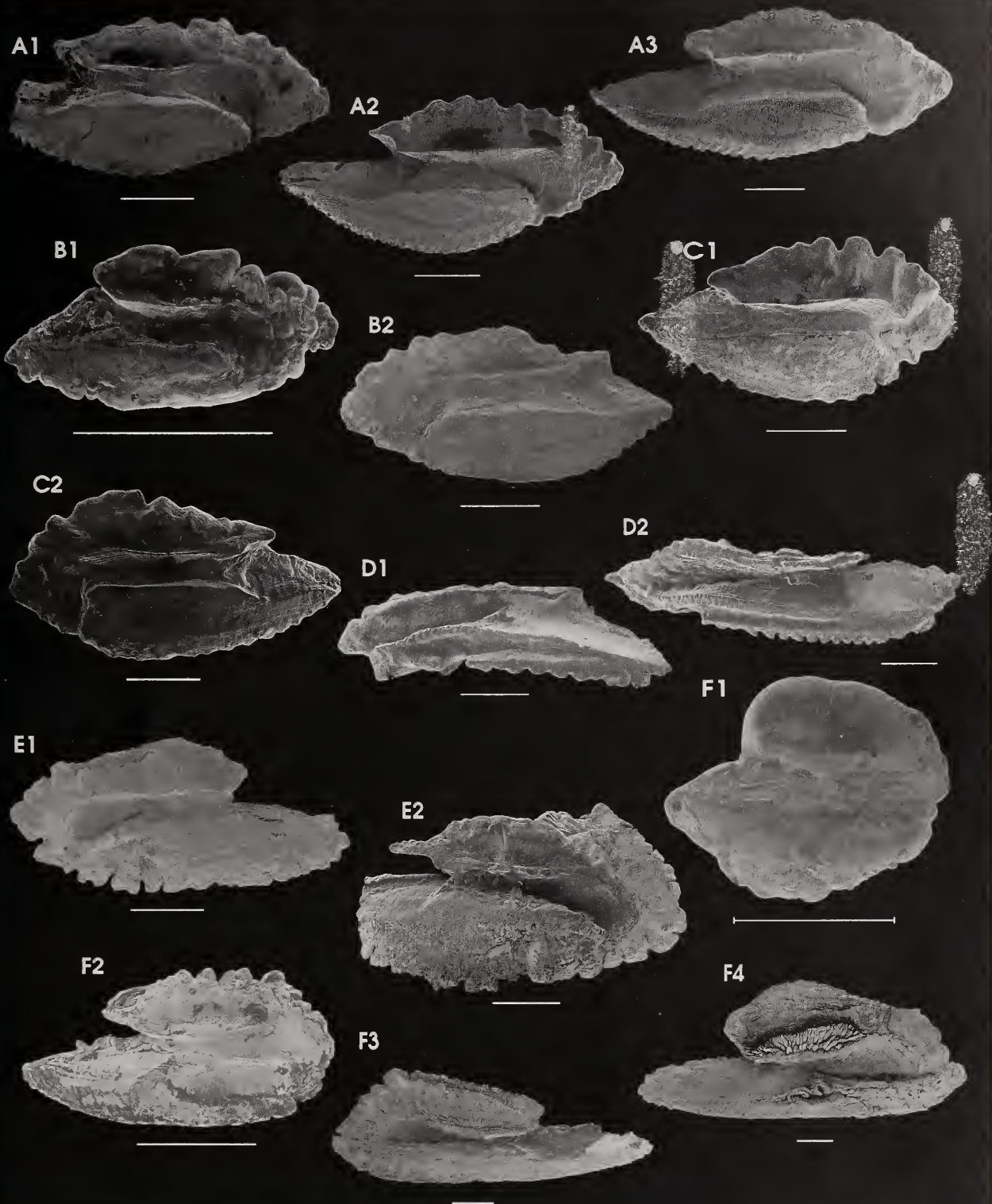


Plate 72. CARANGIDAE 306 ctd. A. *Decapterus macarellus* SSF 210.26. A1. PEM 14277 (RUSI 33516) - R. 5.0 mm OD, 257 mm TL. A2. PEM 15677 - R. 5.38 mm OD, 287 mm TL. A3. PEM 15775 - R. 6.44 mm OD, 325 mm TL. B. *D. macrosoma* SSF 210.27. B1. PEM 7270 - R. 1.8 mm OD, 63 mm TL. B2. PEM 13071 (RUSI 28371) - L. 4.1 mm OD, 197 mm TL. C. *D. russelli* SSF 210.29. C1. PEM 15459 (RUSI 40556) - R. 4.05 mm OD, 147 mm TL. C2. PEM 15457 (RUSI 40556) - L. 4.6 mm OD, 170 mm TL. D. *Elagatis bipinnulata* SSF 210.31. D1. PEM 2081 - L. 4.95 mm OD, 415 mm FL. D2. PEM 5918 - L. 6.2 mm OD, 487 mm FL. E. *Gnathanodon speciosus* SSF 210.32. E1. PEM 9597 - L. 4.9 mm OD, 285 mm TL. E2. PEM 2722 - R. broken, 449 mm TL. F. *Lichia amia* SSF 210.33. F1. PEM 1594 - R. 0.89 mm OD, 59 mm TL. F2. PEM 2959 - R. 2.72 mm OD, 221 mm TL. F3. PEM 1140 - L. 8.02 mm OD, 601 mm FL. F4. PEM 14854 - R. 9.8 mm OD, 1015 mm TL. Scale bars 1 mm (—) or 0.5 mm (⊥).



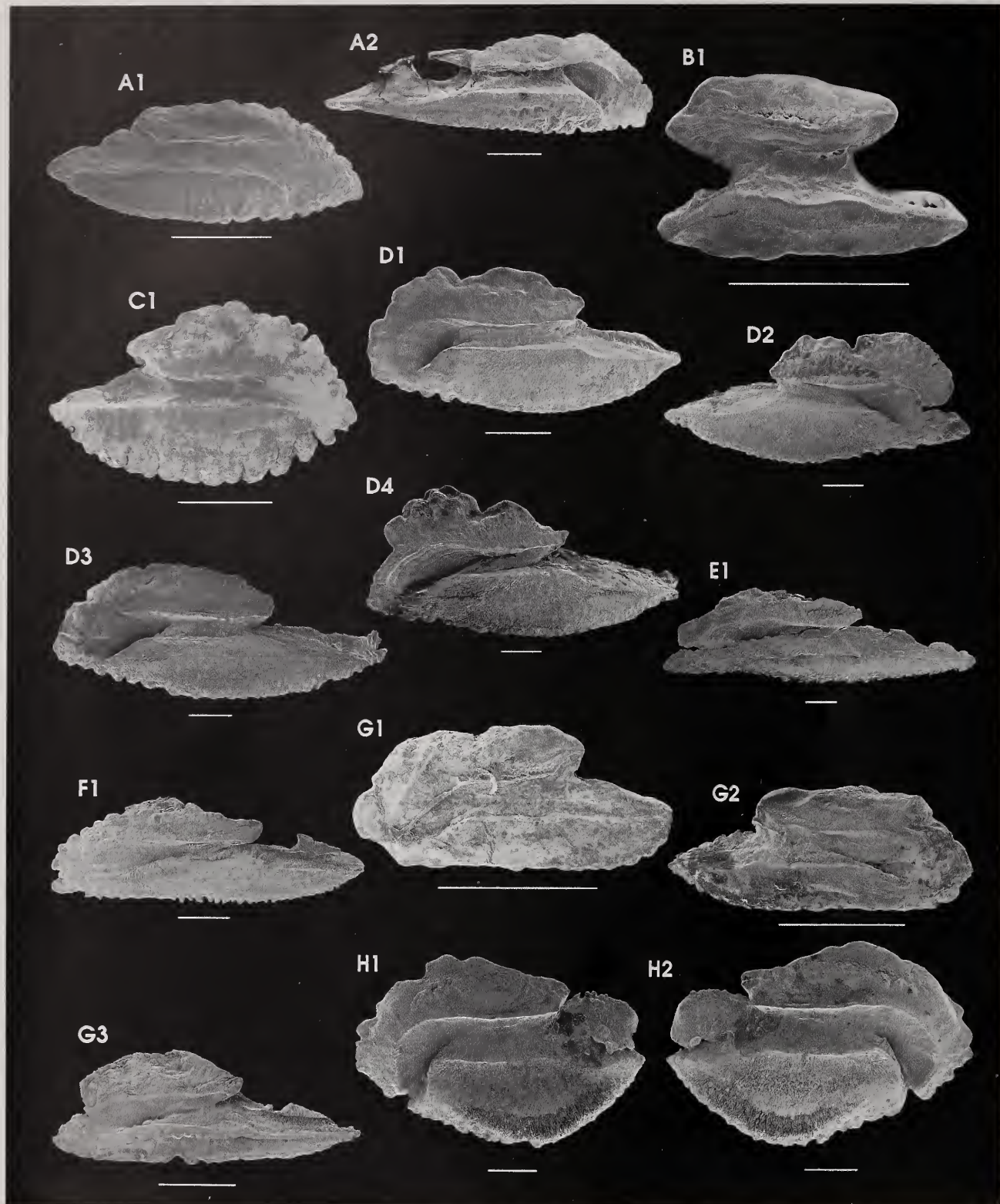


Plate 73. CARANGIDAE 306 ctd. A. *Megalaspis cordyla* SSF 210.34. A1. PEM 3929 - R. 3.25 mm OD, 174 mm TL. A2. PEM 0357 - R. 6.36 mm OD, 315 mm TL. B. *Naucrates ductor* SSF 210.35. B1. PEM 14838 (RUSI 37085) - L. 1.7 mm OD, 258 mm TL. C. *Parastromateus niger* SSF 210.36. C1. PEM 0455 - R. 3.75 mm OD, 100 mm TL. D. *Pseudocaranx dentex* SSF 210.37. D1. PEM 10442 - L. 4.8 mm OD, 277 mm TL. D2. PEM 13072 - R. 7.8 mm OD, 520 mm TL. D3. PEM 15476 (RUSI 40620) - L. 8.04 mm OD, 435 mm TL. D4. PEM 9281 - L. 8.4 mm OD, 555 mm TL. E. *Scomberoides commersonnianus* SSF 210.38. E1. PEM 2696 - L. 10.24 mm OD. F. *S. lysan* SSF 210.39. F1. PEM 0201 - L. 6.56 mm OD, 375 mm TL. G. *S. tol* SSF 210.40. G1. PEM 2070 - L. 2.15 mm OD, 95 mm SL. G2. PEM 2074 - R. 2.45 mm OD, 118 mm SL. G3. PEM 0422 - L. 3.9 mm OD, 270 mm FL. H. *Selar crumenophthalmus* SSF 210.41. H1. PEM 15679 - L. 6.3 mm OD, 305 mm TL. H2. PEM 15679 - R. Scale bars 1 mm (—).



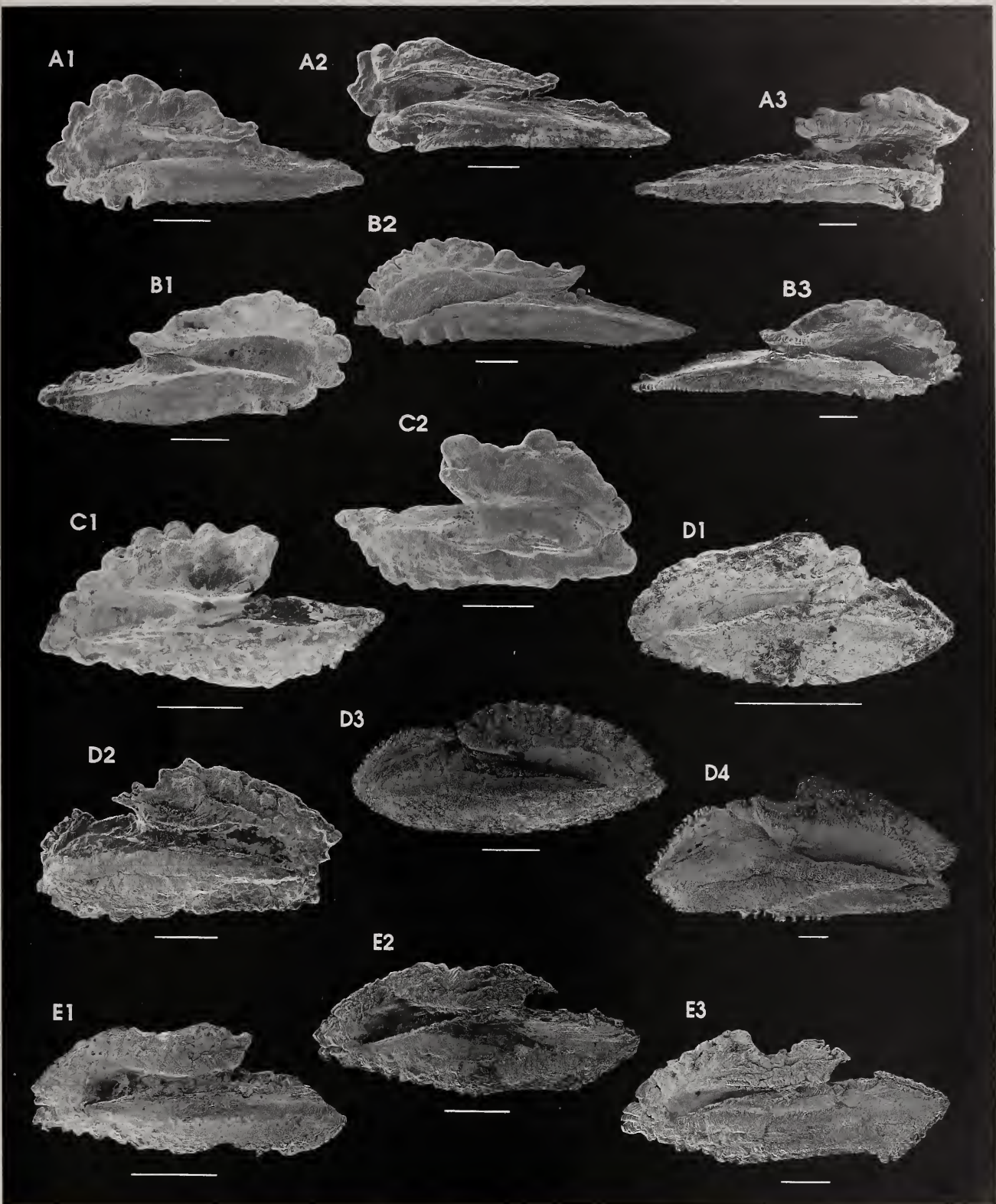


Plate 74. CARANGIDAE 306 ctd. A. *Seriola lalandi* SSF 210.44. A1. PEM 1091 - L. 5.78 mm OD, 493 mm FL. A2. PEM 1339 - L. 6.56 mm OD, 795 mm TL. A3. PEM 7731 - R. 9.3 mm OD, 1368 mm TL. B. *S. rivoliana* SSF 210.45. B1. PEM 1337 (RUSI 8372) - R. 5.74 mm OD, 438 mm TL. B2. PEM 15620 - L. 8.18 mm OD, 580 mm TL. B3. PEM 2922 - R. 9.12 mm OD, 742 mm TL. C. *Seriolina nigrofasciata* SSF 210.46. C1. PEM 6387 - L. 4.1 mm OD, 301 mm TL. C2. PEM 11720 - R. 4.8 mm OD, 374 mm TL. D. *Trachinotus africanus* SSF 210.47. D1. PEM 6636 - L. 2.8 mm OD, 126 mm TL. D2. PEM 1568 (RUSI 8373) - R. 5.18 mm OD, 371 mm TL. D3. PEM 7817 - R. 10.1 mm OD, 810 mm TL. D4. PEM 9640 - R. 13.0 mm OD, 905 mm TL. E. *T. botla* SSF 210.50. E1. PEM 8585 - L. 4.0 mm OD, 212 mm TL. E2. PEM 7444 - L. 5.2 mm OD, 265 mm TL. E3. PEM 7449 - L. 7.0 mm OD, 410 mm TL. Scale bars 1 mm (—).



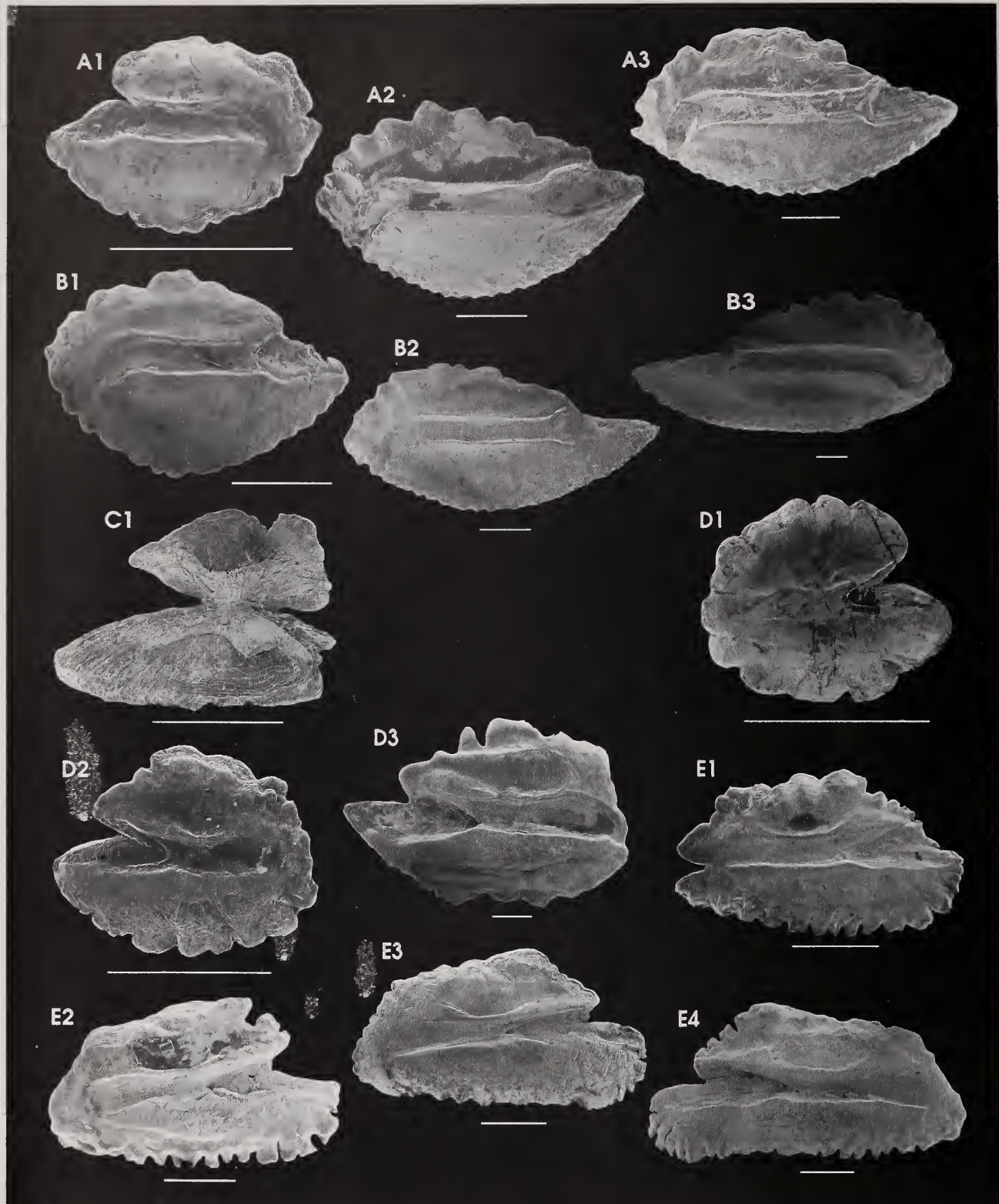


Plate 75. CARANGIDAE 306 ctd. A. *Trachurus delagoa* SSF 210.51. A1. PEM 2541 - R. 1.69 mm OD, 52 mm TL. A2. PEM 6721 (RUSI 28372) - L. 4.8 mm OD, 152 mm TL. A3. PEM 6710 - L. 6.1 mm OD, 184 mm TL. B. *T. trachurus* SSF 210.52. B1. PEM 14438 (RUSI 28373) - L. 3.4 mm OD, 105 mm TL. B2. PEM 12408 - L. 6.6 mm OD, 183 mm TL. B3. PEM 10542 - R. 11.05 mm OD, 418 mm TL. CORYPIAENIDAE 308. C. *Coryphaena hippurus* SSF 211.2. C1. PEM 15372 - R. 2.2 mm OD, 981 mm TL. LEIOGNATHIDAE 311. D. *Gazza minuta* SSF 201.1. D1. PEM 9359 - L. 1.4 mm OD, 47 mm TL. D2. PEM 9354 - R. 1.9 mm OD, 55 mm TL. D3. PEM 6753 (RUSI 28375) - R. 7.9 mm OD, 161 mm TL. E. *Leiognathus equula* SSF 201.3. E1. PEM 6749 (RUSI 28376) - L. 3.6 mm OD, 110 mm TL. E2. PEM 15284 (RUSI 36870) - L. 4.4 mm OD, 151 mm TL. E3. PEM 14525 (RUSI 31459) - L. 4.8 mm OD, 172 mm TL. E4. PEM 14529 - R. 6.3 mm OD, 223 mm TL. Scale bars 1 mm (—).



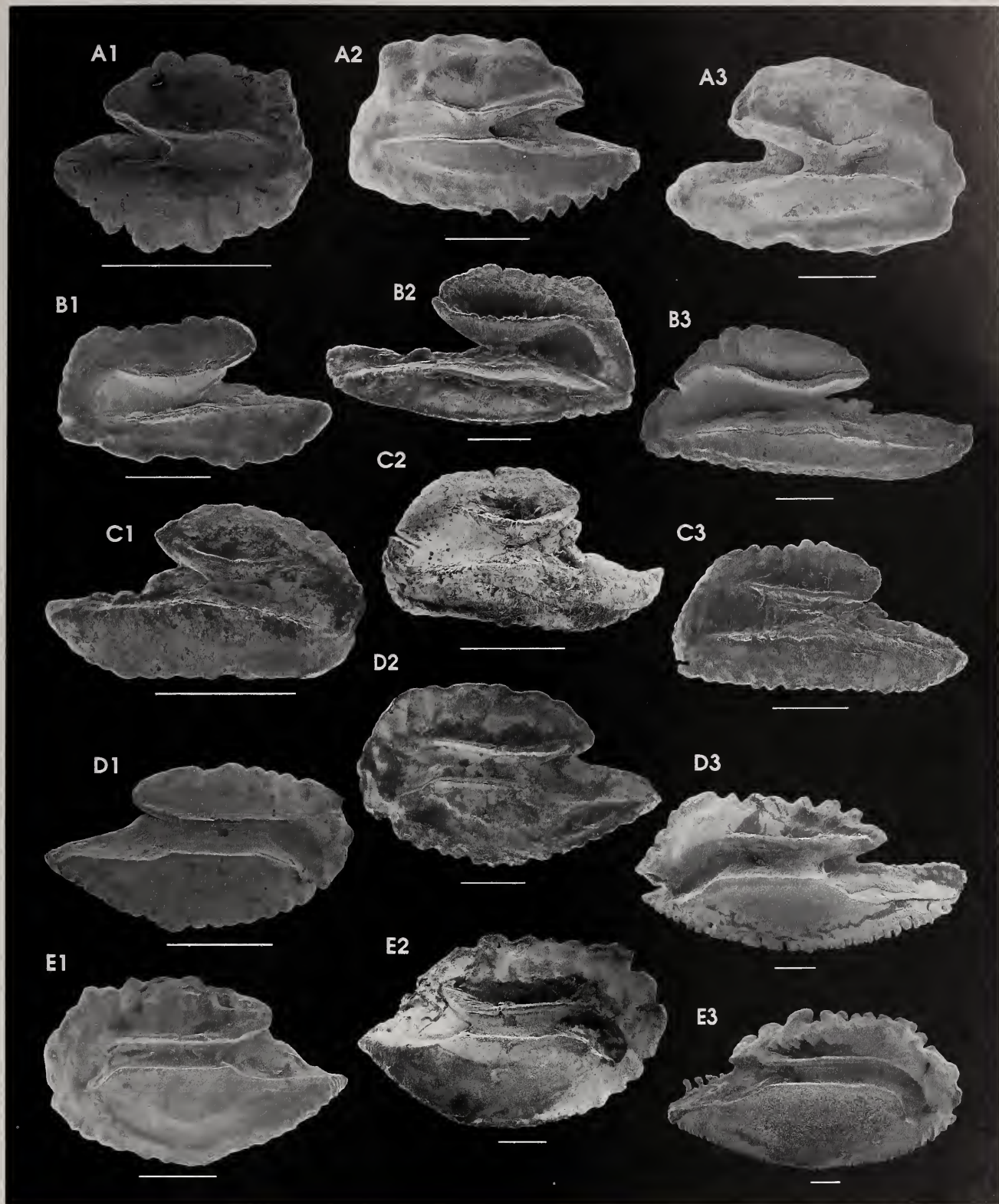


Plate 76. LEIOGNATHIDAE 311 ctd. A. *Secutor insidiator* SSF 201.4. A1. PEM 2080 - R. 1.7 mm OD, 50 mm TL. A2. PEM 15267 (RUSI 36872) - L. 3.6 mm OD, 108 mm TL. A3. PEM 6750 (RUSI 28374) - R. 4.1 mm OD, 125 mm TL. **BRAMIDAE 312.** B. *Brama brama* SSF 207.1. B1. PEM 13874 - L. 3.5 mm OD, 351 mm TL. B2. PEM 13869 - R. 5.1 mm OD 552 mm TL. B3. PEM 13178 - L. 6.2 mm OD, 555 mm TL. C. *B. orcini* SSF 207.2. C1. PEM 5164 - R. 2.3 mm OD, 128 mm TL. C2. PEM 5161 - L. 2.7 mm OD, 159 mm TL. C3. PEM 7915 (RUSI 20115) - L. 3.4 mm OD, 262 mm TL. **EMMELICHTHYIDAE 315.** D. *Emmelichthys nitidus nitidus* SSF 209.1. D1. PEM 14720 - R. 3.1 mm OD, 101 mm TL. D2. PEM 12123 - L. 5.1 mm OD, 162 mm TL. D3. PEM 12227 - L. 8.9 mm OD, 371 mm TL. E. *Plagiogeneion rubiginosus* SSF 209.3. E1. PEM 14437 (RUSI 28377) - L. 4.1 mm OD, 120 mm TL. E2. PEM 14359 - R. 6.8 mm OD, 202 mm TL. E3. PEM 11695 - R. 11.0 mm OD, 365 mm TL. Scale bars 1 mm (—).



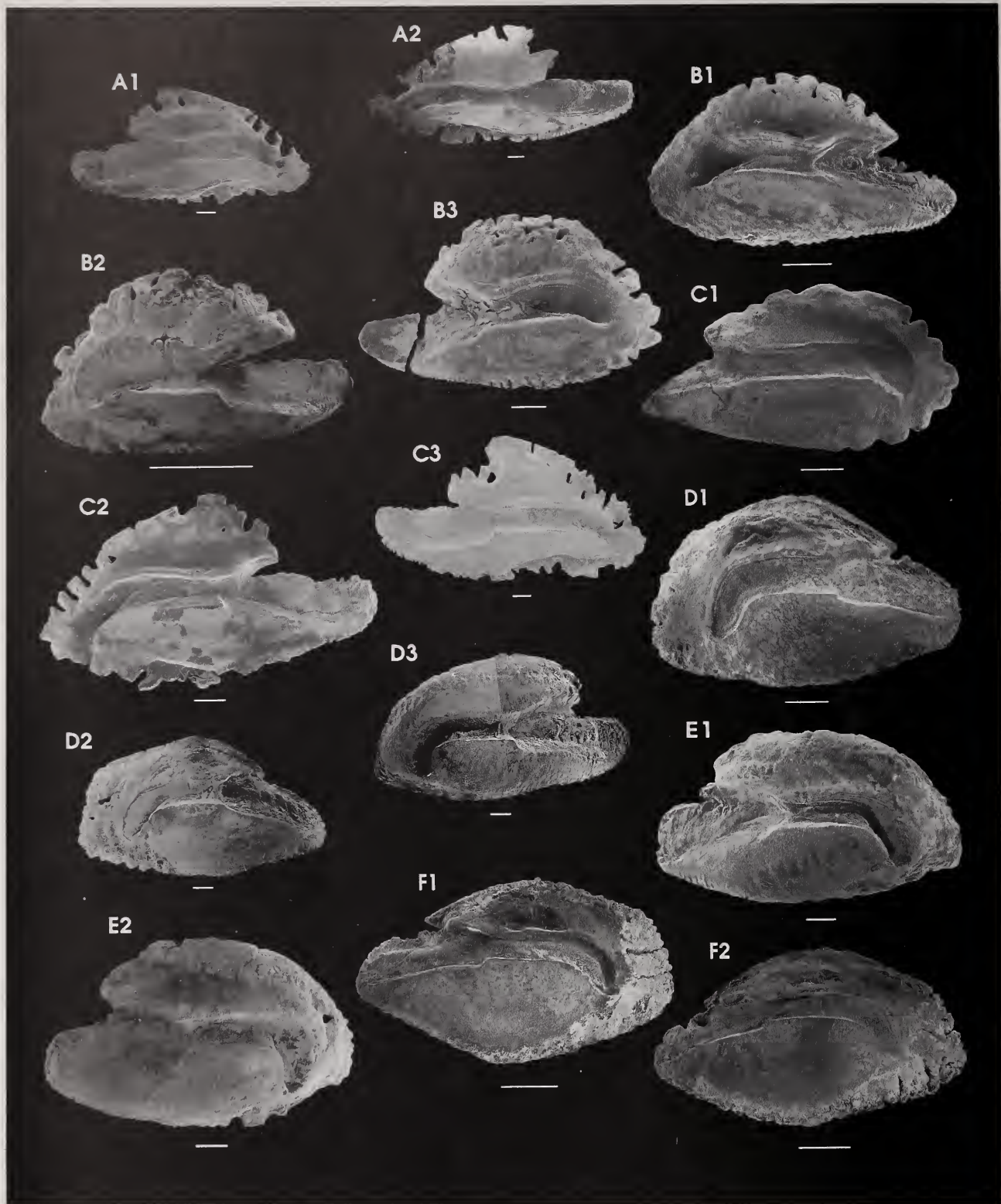


Plate 77. LUTJANIDAE 316. A. *Aphareus rutilans* SSF 181.2. A1. PEM 15609 - R. 13.6 mm OD, 650 mm TL. A2. 1408H - L. 17.28 mm OD, 900 mm TL. B. *Aprion virescens* SSF 181.3. B1. PEM 8406 - L. 7.1 mm OD, 351 mm TL. B2. PEM 8487 - L. 8.6 mm OD, 505 mm TL. B3. PEM 1658 (RUSI 8538) - R. 9.1 mm OD, 671 mm TL. C. *Etelis coruscans* SSF 181.4. C1. PEM 14546 (RUSI 31436) - R. 7.9 mm OD, 255 mm TL. C2. PEM 8496 - L. 11.3 mm OD, 573 mm TL. C3. PEM 8478 - R. 16.0 mm OD, 725 mm TL. D. *Lutjanus argenteimaculatus* SSF 181.5. D1. PEM 0733 - L. 7.48 mm OD, 200 mm TL. D2. PEM 7431 - L. 13.3 mm OD, 463 mm TL. D3. PEM 1922 (RUSI 11162) - L. 13.54 mm OD, 636 mm TL. E. *L. bohar* SSF 181.6. E1. PEM 8370 - R. 10.4 mm OD, 402 mm TL. E2. PEM 8375 - R. 10.1 mm OD, 515 mm TL. F. *L. fulviflamma* SSF 181.8. F1. PEM 0738 - R. 5.66 mm OD, 120 mm TL. F2. PEM 0739 - R. 6.24 mm OD, 135 mm TL. Scale bars 1 mm (—).



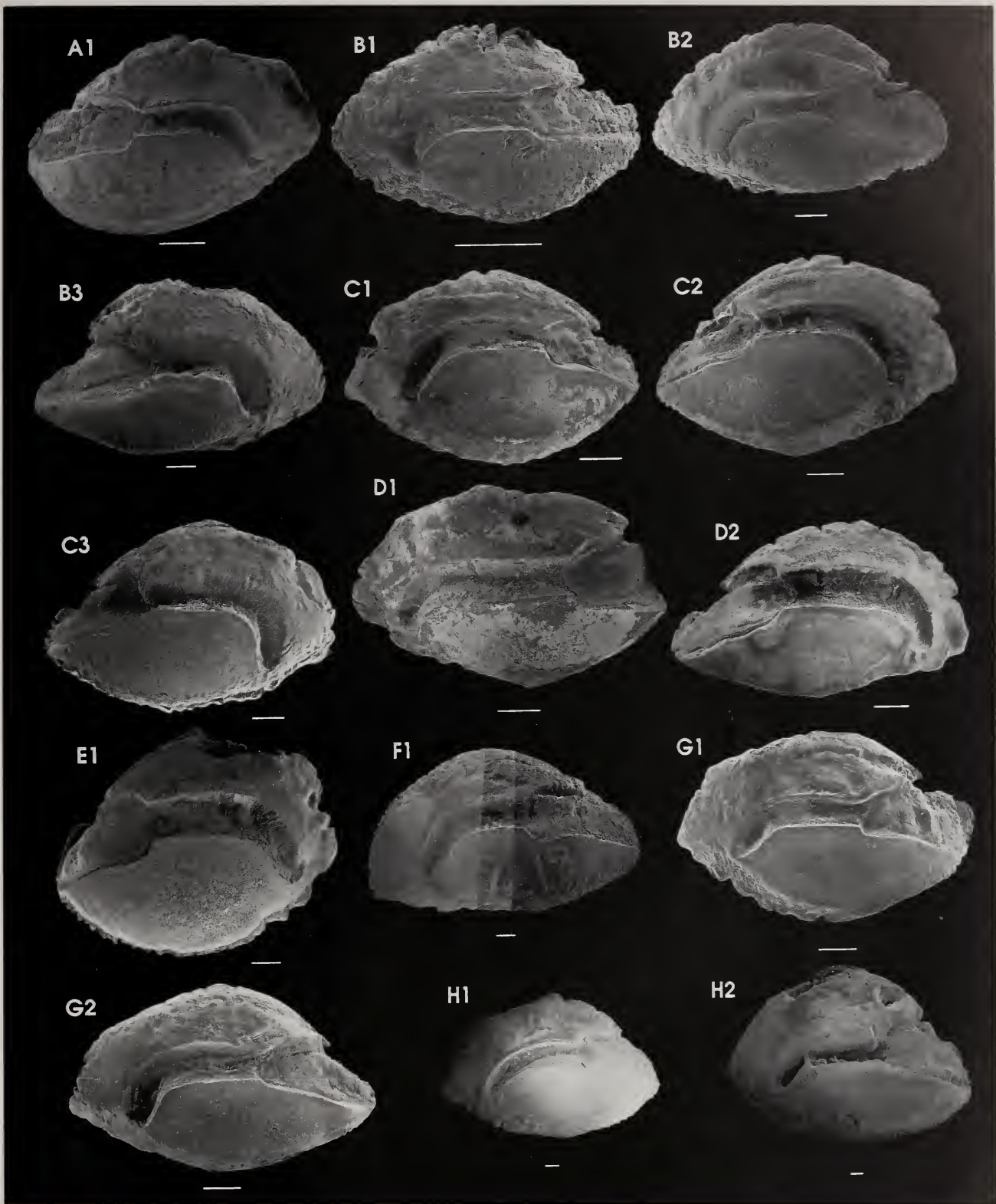


Plate 78. LUTJANIDAE 316 ctd. A. *Lutjanus fulvus* SSF 181.9. A1. PEM 14561 (RUSI 31393) - R. 6.8 mm OD, 143 mm TL. B. *L. gibbus* SSF 181.10. B1. PEM 15630 - L. 3.6 mm OD, 81 mm TL. B2. PEM 15770 - L. 9.98 mm OD, 320 mm TL. B3. PEM 5662 - R. 10.8 mm OD, 329 mm FL. C. *L. kasmira* SSF 181.11. C1. PEM 8305 (RUSI 34141) - L. 7.0 mm OD, 163 mm TL. C2. PEM 8286 - R. 8.5 mm OD, 195 mm TL. C3. PEM 8405 - R. 10.0 mm OD, 231 mm TL. D. *L. lutjanus* SSF 181.13. D1. PEM 0495 - L. c.7.5 mm OD, 170 mm TL. D2. PEM 8157 (RUSI 34084) - R. 9.7 mm OD, 220 mm TL. E. *L. notatus* SSF 118.15. E1. PEM 4611 - R. 11.18 mm OD, 255 mm TL. F. *L. rivulatus* SSF 181.16. F1. PEM 8171 - L. 14.7 mm OD, 455 mm TL. G. *L. russellii* SSF 181.17. G1. PEM 8729 (RUSI 37457) - L. 8.6 mm OD, 206 mm TL. G2. PEM 8307 - L. 9.1 mm OD, 232 mm TL. H. *L. sanguineus* SSF 181.18. H1. PEM 4425 - L. 17.6 mm OD, 597 mm TL. H2. PEM 5964 - L. 22.7 mm OD, c.730 mm TL. Scale bars 1 mm (—).

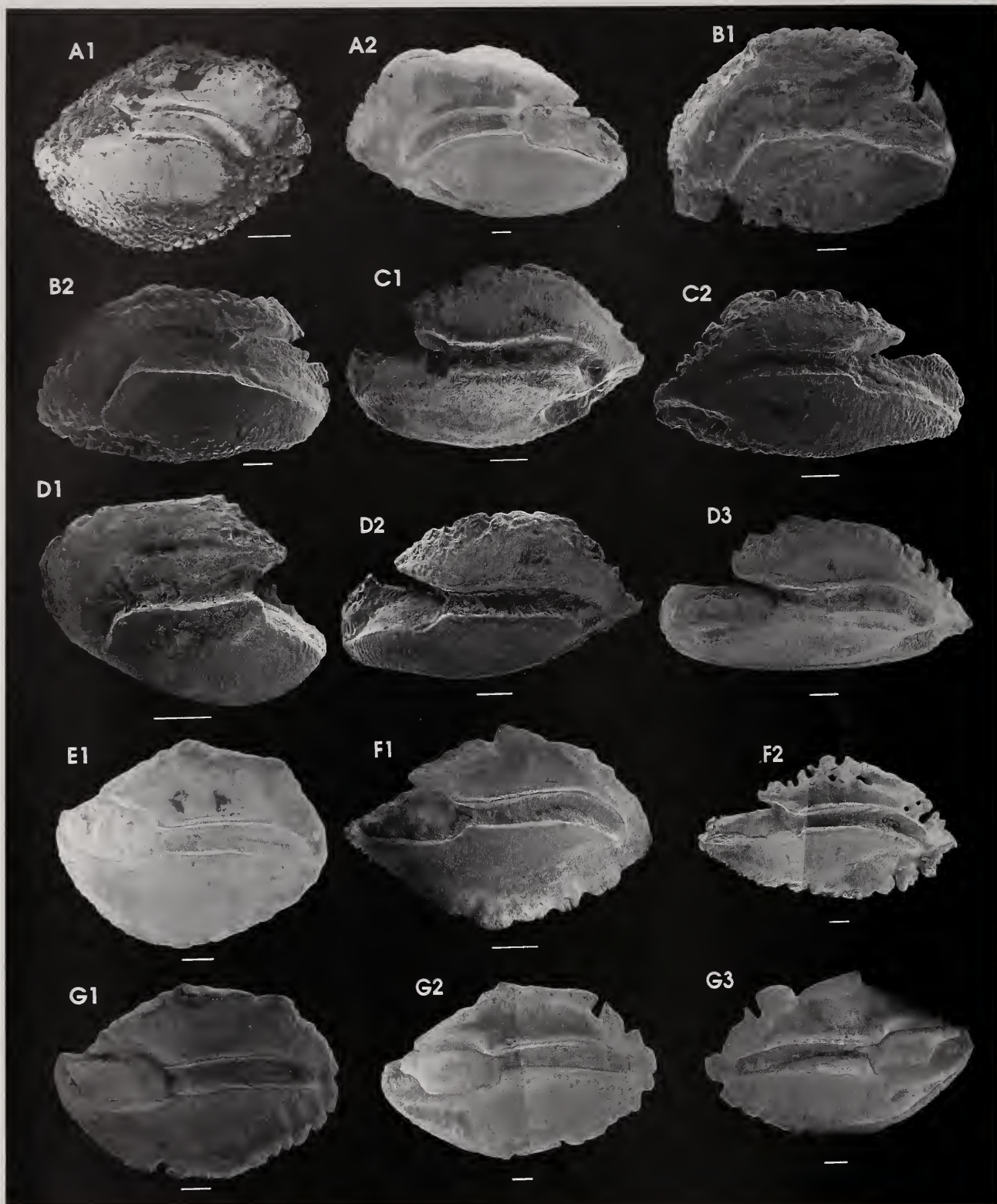


Plate 79. LUTJANIDAE 316 etd. A. *Lutjanus sebae* SSF 181.19. A1. PEM 0498 - R. 7.1 mm OD, 140 mm TL. A2. PEM 0443 - L. 15.89 mm OD, 470 mm TL. B. *Macolor niger* SSF 181.20. B1. PEM 0862 - L. 11.12 mm OD, 575 mm TL. B2. PEM 15484 (RUSI 40615) - L. 11.51 mm OD, 454 mm TL. C. *Paracaesio sordida* SSF 181.-. C1. PEM 8188 (RUSI 38882) - R. 8.7 mm OD, 350 mm TL. C2. PEM 15377 - L. 8.84 mm OD, 360 mm TL. D. *P. xanthura* SSF 181.21. D1. PEM 8205 - L. 8.7 mm OD, 350 mm TL. D2. PEM 8189 - R. 9.8 mm OD, 375 mm TL. D3. PEM 14858 (RUSI 35533) - R. 10.9 mm OD, 495 mm TL. E. *Pristipomoides argyrogrammicus* SSF 181.-. E1. PEM 14523 (RUSI 31445) - R. 9.7 mm OD, 185 mm TL. F. *P. filamentosus* SSF 181.22. F1. PEM 14521 (RUSI 31387) - R. 7.2 mm OD, 180 mm TL. F2. PEM 8376 - R. 13.7 mm OD, 585 mm TL. G. *P. zonatus* SSF 181.24. G1. PEM 14537 (RUSI 31429) - R. 11.0 mm OD, 232 mm TL. G2. PEM 15610 - R. 14.44 mm OD, 390 mm TL. G3. PEM 15600 - L. 16.88 mm OD, 475 mm TL. Scale bars 1 mm (—).



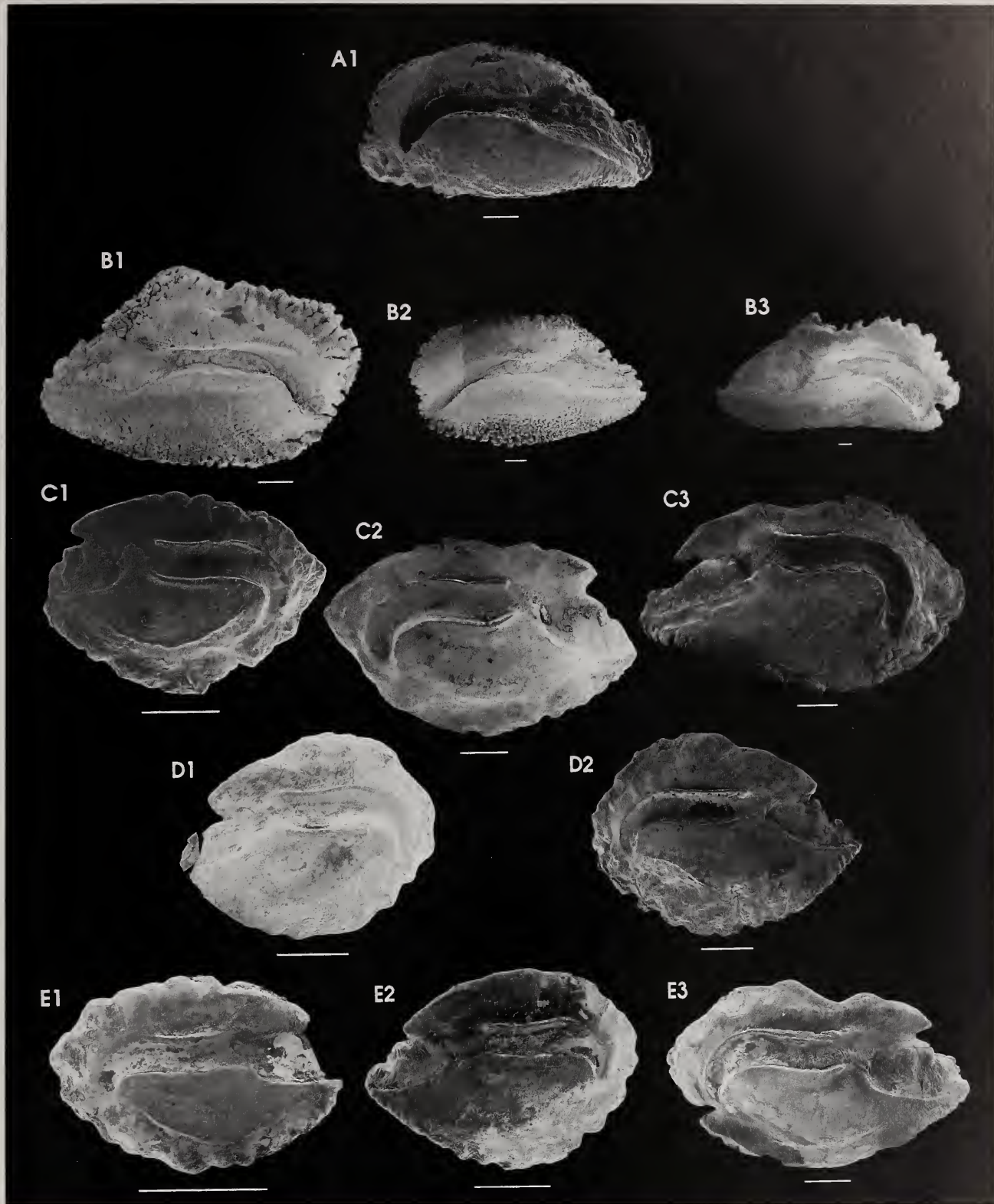


Plate 80. CAESIONIDAE 317. A. *Caesio teres* SSF 182.2. A1. PEM 2751 - L. 8.98 mm OD, 334 mm TL. LOBOTIDAE 318. B. *Lobotes surinamensis* SSF 202.1. B1. PEM 14805 - R. 10.0 mm OD, 410 mm TL. B2. PEM 14861 (RUSI 35532) - L. 11.9 mm OD, 457 mm TL. B3. PEM 8549 - R. 20.0 mm OD, 790 mm TL. GERREIDAE 319. C. *Gerres acinaces* SSF 194.1. C1. PEM 15449 (RUSI 40567) - R. 3.95 mm OD, 107 mm TL. C2. PEM 15343 - L. 6.76 mm OD, 156 mm SL. C3. PEM 14575 - R. 8.7 mm OD, 320 mm TL. D. *G. filamentosus* SSF 194.2. D1. PEM 15345 - R. 3.65 mm OD, 115 mm TL. D2. PEM 0362 - L. 5.70 mm OD, 155 mm TL. E. *G. oblongus* SSF 194.3. E1. PEM 2067 - L. 2.4 mm OD, 55 mm TL. E2. PEM 2066 - R. 3.75 mm OD, 99 mm TL. E3. PEM 5972 - L. 7.20 mm OD, 242 mm TL. Scale bars 1 mm (—).

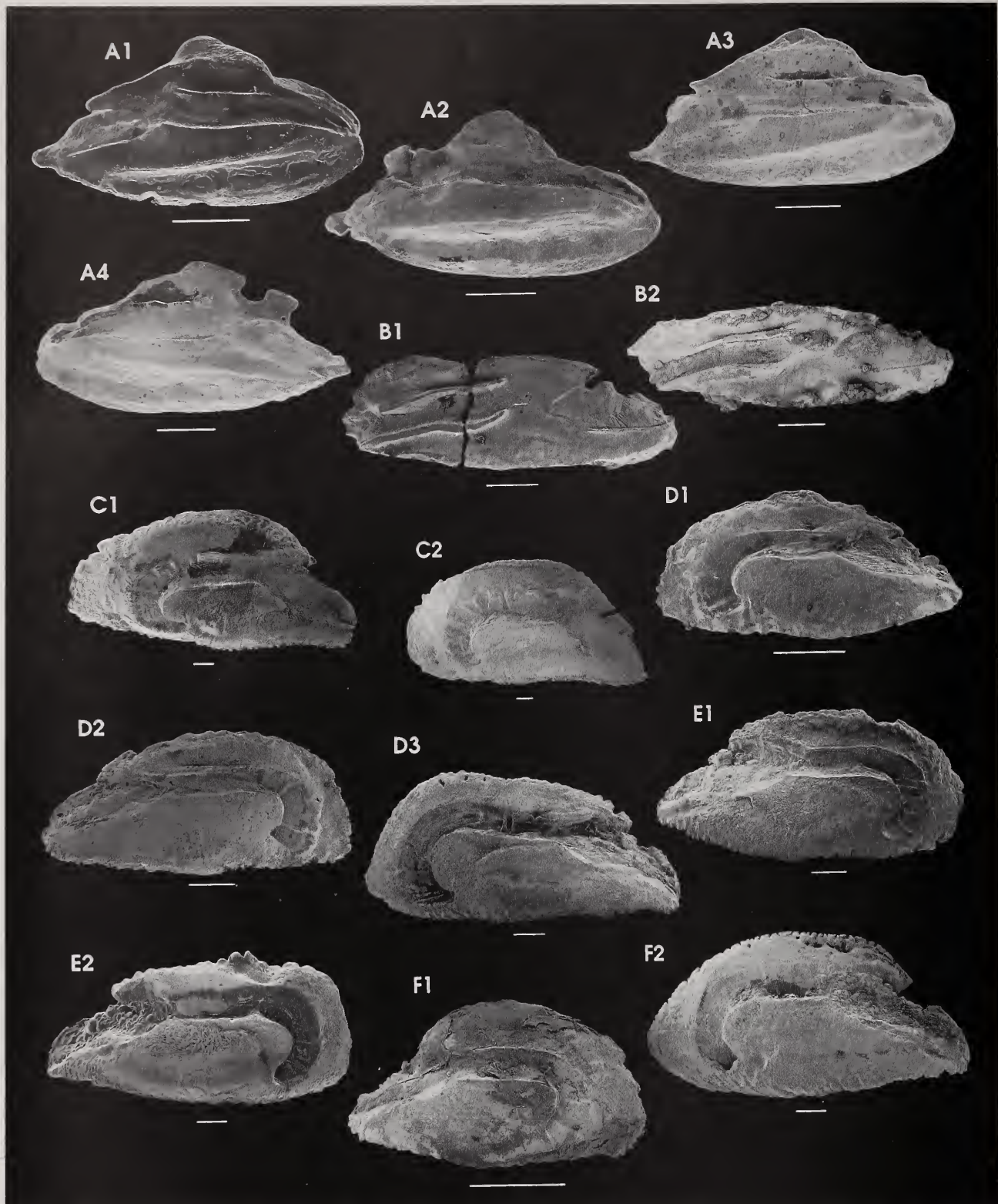


Plate 81. GERREIDAE 319 ctd. A. *Gerres oyena* SSF 194.4. A1. 0611H - R. 4.4 mm OD, 125 mm TL. A2. 0610H - R. 4.7 mm OD, 142 mm TL. A3. PEM 15729 (RUSI 42707) - R. 5.0 mm OD, 160 mm TL. A4. PEM 15728 (RUSI 42707) - L. 5.58 mm OD, 183 mm TL. B. *G. rappa* SSF 194.5. B1. 0141H - L. c.6.8 mm OD, 213 mm TL. B2. PEM 15347 - L. 7.26 mm OD, 121 mm SL. IIAEMULIDAE 320. C. *Diagramma pictum* SSF 179.1. C1. PEM 5678 - L. 15.4 mm OD, 610 mm TL. C2. PEM 5677 - L. 16.4 mm OD, 700 mm TL. D. *Plectorhinchus chubbi* SSF 179.2. D1. PEM 0457 - L. 4.45 mm OD, 131 mm TL. D2. PEM 6153 - R. 7.3 mm OD, 258 mm TL. D3. PEM 0727 - L. 11.12 mm OD, 584 mm TL. E. *P. flavomaculatus* SSF 179.3. E1. PEM 15401 (RUSI 40604) - R. 9.44 mm OD, 419 mm TL. E2. PEM 6778 - R. 11.0 mm OD, 557 mm TL. F. *P. gaterinus* SSF 179.4. F1. PEM 0500 - R. 6.68 mm OD, 180 mm TL. F2. 1056H - L. 12.68 mm OD. Scale bars 1 mm (—).



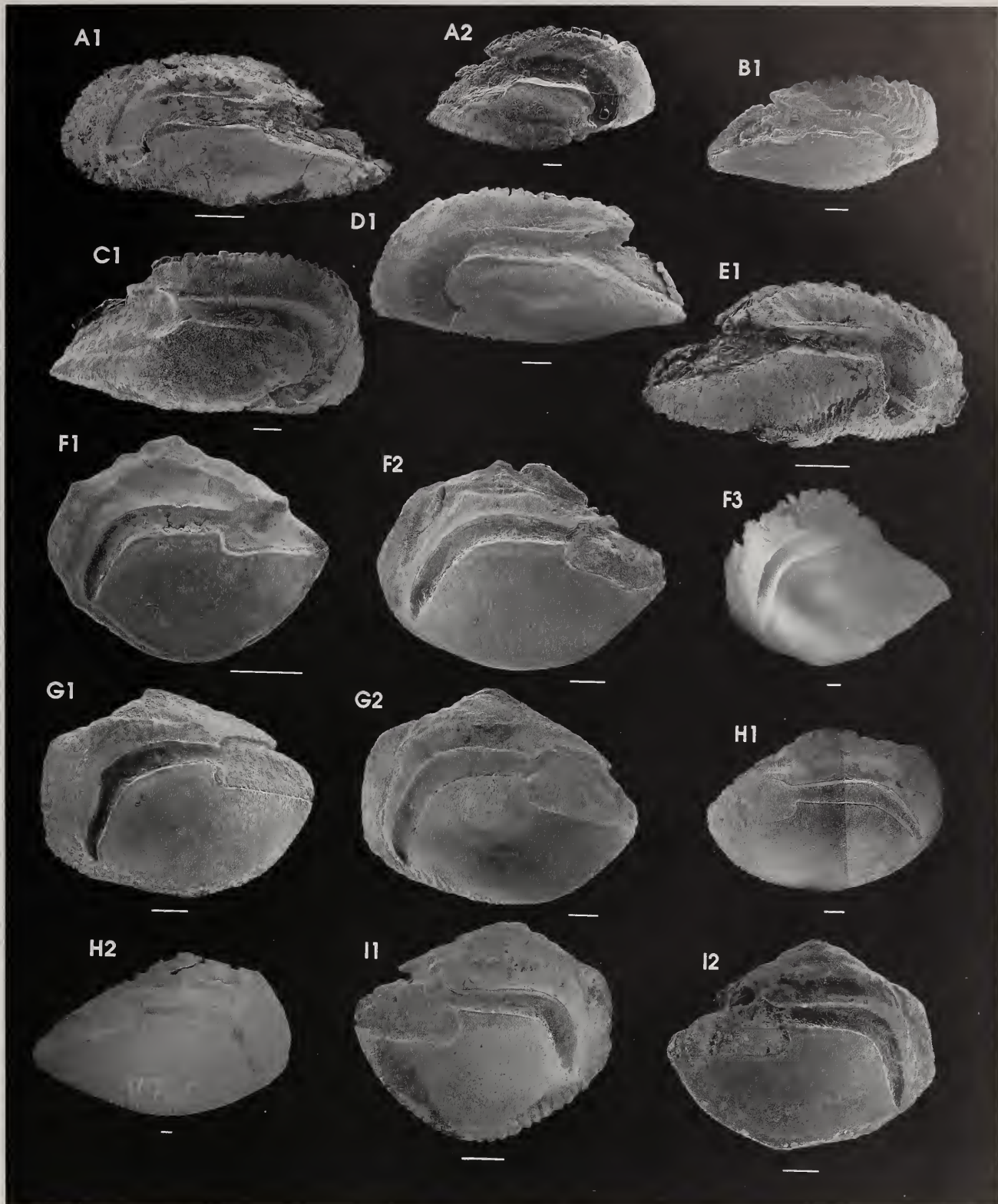
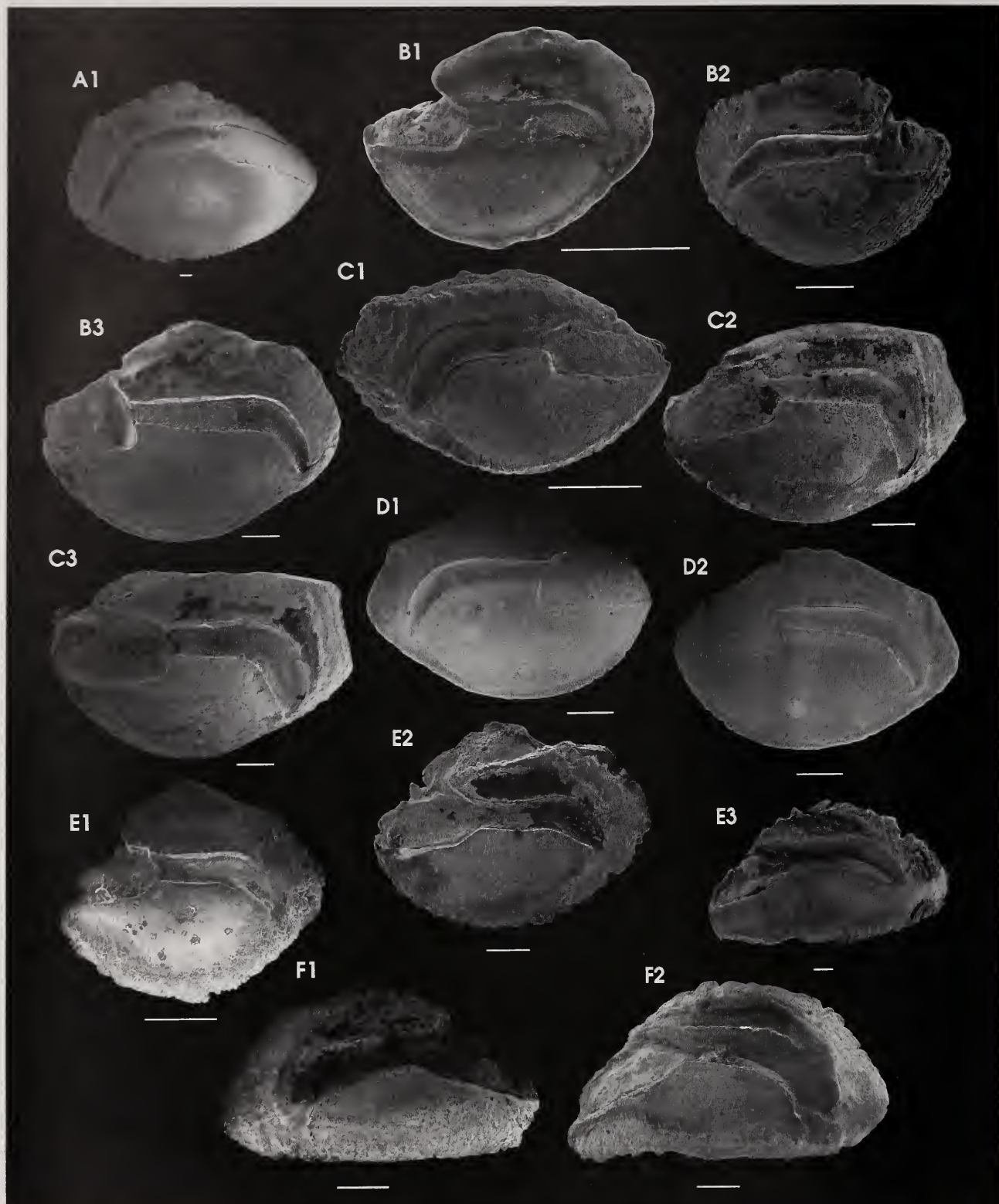


Plate 82. HAEMULIDAE 320 ctd. A. *Plectorhynchus gibbosus* SSF 179.5. A1. PEM 0729 - L. 6.92 mm OD, 180 mm TL. A2. PEM 7454 - R. 13.3 mm OD, 612 mm TL. B. *P. plagiodesmus* SSF 179.6. B1. PEM 15483 (RUSI 40616) - R. 11.02 mm OD, 420 mm TL. C. *P. playfairi* SSF 179.7. C1. PEM 8249 - R. 12.0 mm OD, 590 mm TL. D. *P. schotaf* SSF 179.8. D1. PEM 8191 - L. 12.1 mm OD, 670 mm TL. E. *P. sordidus* SSF 179.9. E1. PEM 2713 - R. 6.06 mm OD, 200 mm TL. F. *Pomadasya commersonii* SSF 179.10. F1. PEM 2216 - L. 4.12 mm OD, 84 mm TL. F2. PEM 9614 - L. 8.7 mm OD, 149 mm SL. F3. PEM 10495 - L. 18.8 mm OD 932 mm TL. G. *P. furcatum* SSF 179.11. G1. PEM 2690 - L. 8.94 mm OD, 212 mm TL. G2. PEM 6119 - L. 10.0 mm OD. H. *P. kaakan* SSF 179.13. H1. PEM 0406 - R. 12.88 mm OD, 243 mm TL. H2. PEM 11740 - R. 25.7 mm OD, 652 mm TL. I. *P. maculatum* SSF 179.15. I1. PEM 6104 - R. 6.2 mm OD, 128 mm TL. I2. PEM 9620 - R. 8.6 mm OD, 135 mm SL. Scale bars 1 mm (—).



**Plate 83. HAEMULIDAE 320 ctd. A. *Pomadasys multiimaculatum* SSF 179.16. A1. PEM 7345 - L. 23.3 mm OD, 586 mm TL. B. *P. olivaceum* SSF 179.17. B1. PEM 4675 (RUSI 14930) - R. 2.37 mm OD, 42 mm TL. B2. PEM 3054 - L. 4.81 mm OD, 93 mm TL. B3. PEM 3724 - R. 9.2 mm OD, 188 mm TL. C. *P. striatum* SSF 179.18. C1. PEM 0092 - L. 3.65 mm OD, 47 mm TL. C2. PEM 6539 (RUSI 28379) - R. 8.3 mm OD, 156 mm TL. C3. PEM 0718 - R. 8.92 mm OD, 195 mm TL. D. *P. stridens* SSF 179.19. D1. PEM 15543 (RUSI 42631) - L. 3.19 mm OD, 128 mm TL. D2. PEM 15543 - R. SPARIDAE 322. E. *Acanthopagrus berda* SSF 183.1. E1. PEM 0843 - R. 3.85 mm OD, 107 mm TL. E2. PEM 8731 - R. 6.8 mm OD, 195 mm TL. E3. PEM 7951 - R. 13.4 mm OD, 500 mm TL. F. *A. bifasciatus* SSF 183.2. F1. PEM 2827 - L. 5.18 mm OD, 219 mm TL. F2. PEM 7432 - R. 8.3 mm OD, 300 mm TL. Scale bars 1 mm (—).**



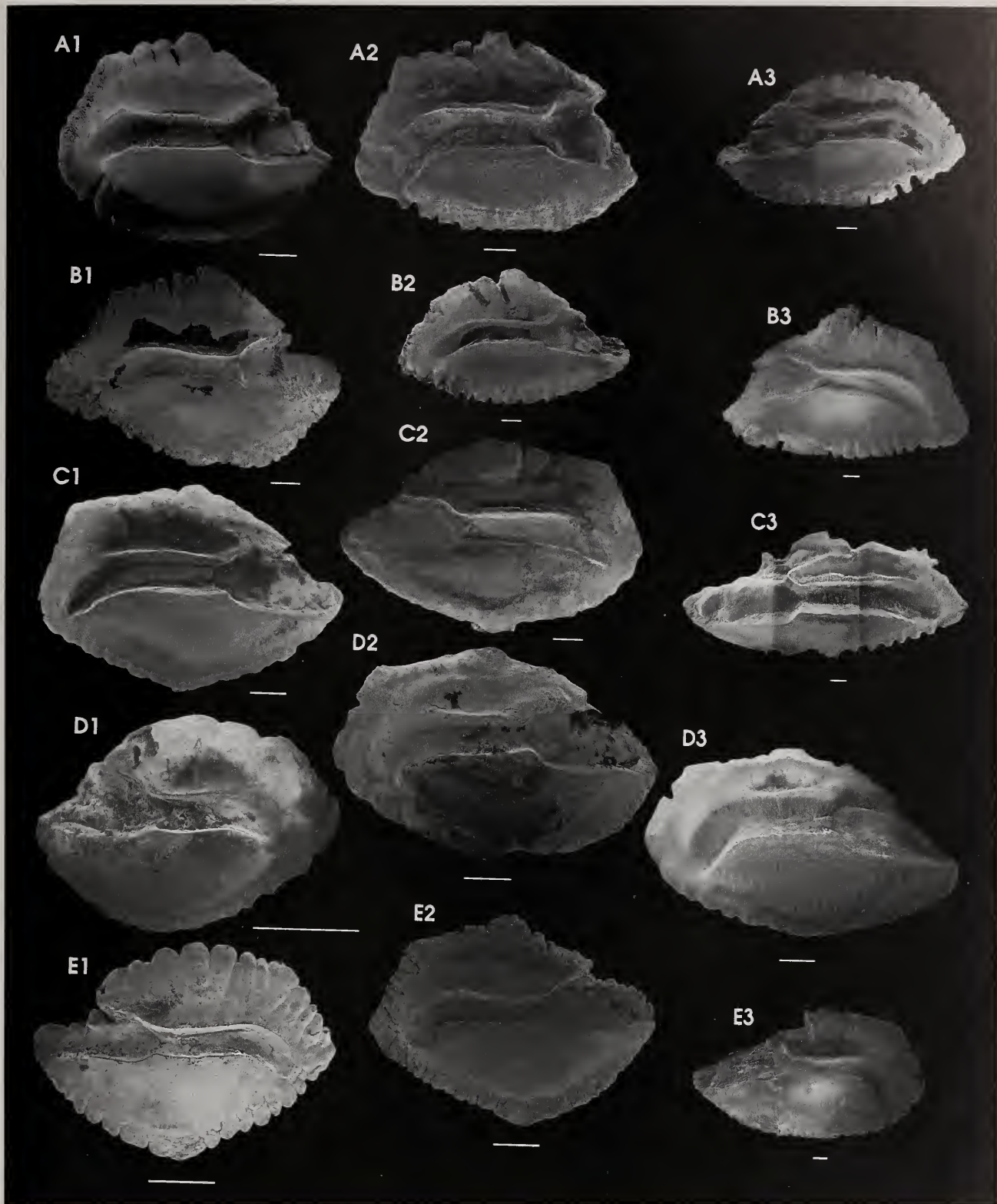


Plate 84. SPARIDAE 322 ctd. A. *Argyrops filamentosus* SSF 183.3. A1. PEM 14860 (RUSI 35591) - L. c.7.72 mm OD, 219 mm TL. A2. PEM 8645 - L. 10.0 mm OD, 208 mm SL. A3. PEM 5999 - R. 13.0 mm OD, 392 mm TL. B. *A. spinifer* SSF 183.4. B1. PEM 6776 - L. 11.8 mm OD, 360 mm TL. B2. PEM 5674 - L. 13.0 mm OD, 350 mm FL. B3. PEM 5990 - R. 16.2 mm OD, 540 mm FL. C. *Argyrozona argyrozona* SSF 183.5. C1. PEM 6792 - L. 10.0 mm OD, 237 mm TL. C2. PEM 10776 - R. 11.8 mm OD, 293 mm TL. C3. PEM 6922 - R. 19.4 mm OD, 532 mm TL. D. *Boopsoidea inornata* SSF 183.6. D1. PEM 10332 - R. 3.1 mm OD, 59 mm TL. D2. PEM 1880 (RUSI 8973) - L. 8.0 mm OD, 177 mm TL. D3. PEM 9585 - L. 10.2 mm OD, 266 mm TL. E. *Cheimerius nufar* SSF 183.7. E1. PEM 4891 - R. 4.8 mm OD, 114 mm TL. E2. PEM 6767 - L. 6.8 mm OD, 185 mm TL. E3. PEM 5772 - R. 17.8 mm OD, 565 mm FL. Scale bars 1 mm (—).

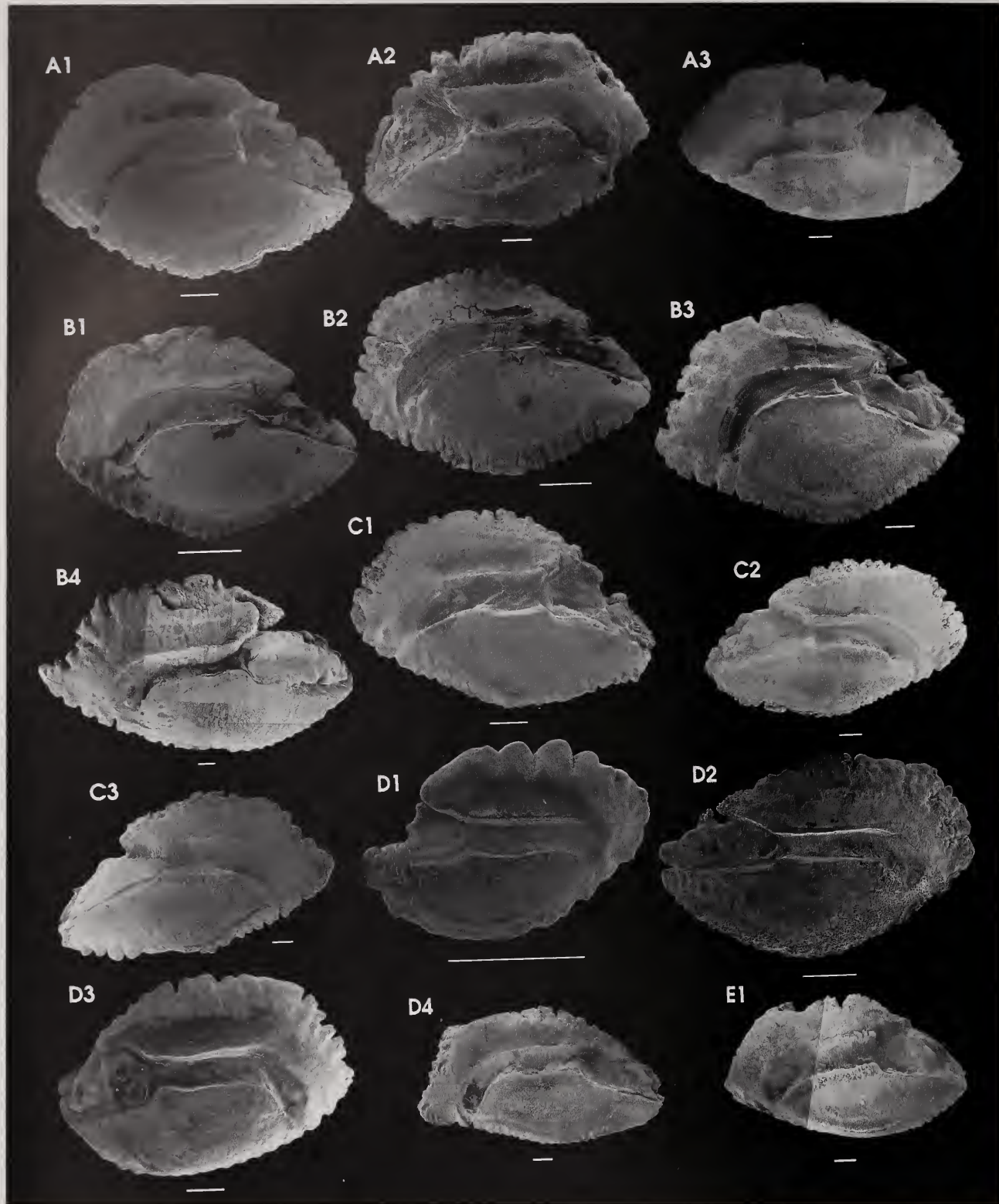


Plate 85. SPARIDAE 322 ctd. A. *Chrysoblephus anglicus* SSF 183.8. A1. PEM 5675 - L. 9.3 mm OD, 264 mm FL. A2. PEM 7763 - R. 11.7 mm OD, 590 mm TL. A3. PEM 7759 - L. 13.1 mm OD, 647 mm TL. B. *C. cristiceps* SSF 183.9. B1. PEM 5481 - L. 5.0 mm OD, 114 mm TL. B2. PEM 7028 - L. 6.9 mm OD, 169 mm TL. B3. PEM 5846 - L. 12.22 mm OD, 329 mm TL. B4. PEM 0152 - L. 19.72 mm OD, 600 mm TL. C. *C. gibbiceps* SSF 183.10. C1. PEM 10794 - L. 8.6 mm OD, 257 mm TL. C2. PEM 15095 - R. 12.36 mm OD, 427 mm TL. C3. PEM 0016 - R. 15.22 mm OD. D. *C. laticeps* SSF 183.11. D1. PEM 1949 - R. 2.65 mm OD, 76 mm TL. D2. PEM 7032 - R. 6.2 mm OD, 154 mm TL. D3. PEM 10887 - R. 8.6 mm OD, 249 mm TL. D4. PEM 6828 - L. 13.5 mm OD, 436 mm TL. E. *C. lophus* SSF 183.12. E1. PEM 6278 - L. 12.0 mm OD, 435 mm TL. Scale bars 1 mm (—).



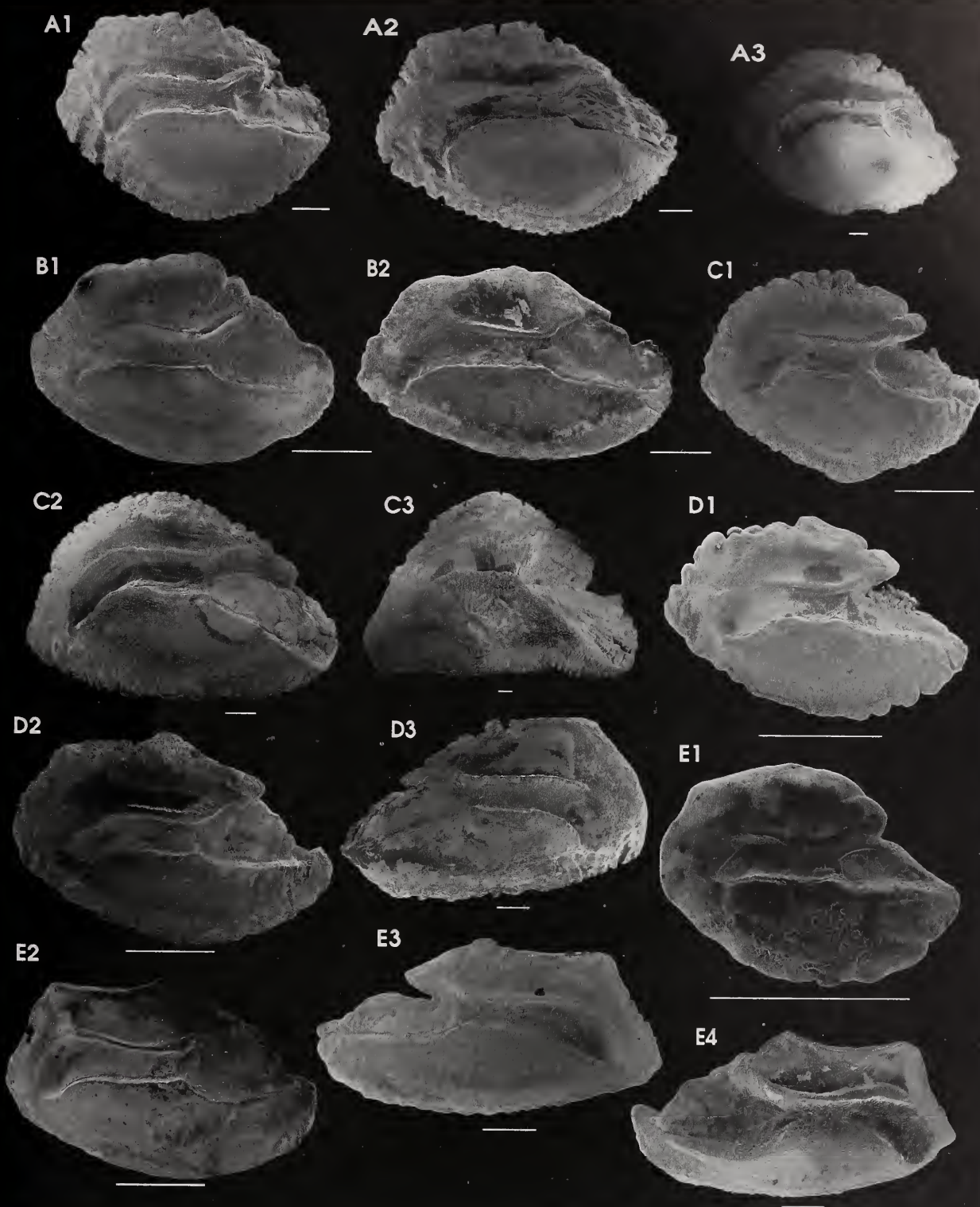


Plate 86. SPARIDAE 322 ctd. A. *Chrysoblephus puniceus* SSF 183.13. A1. PEM 7527 (RUSI 21231) - L. 8.1 mm OD, 207 mm TL. A2. PEM 7755 - L. 10.3 mm OD, 305 mm TL. A3. PEM 7753 - L. 13.2 mm OD, 454 mm TL. B. *Crenidens crenidens* SSF 183.14. B1. PEM 2053 - L. 4.15 mm OD, 101 mm TL. B2. PEM 2047 - L. 5.92 mm OD, 147 mm TL. C. *Cymatoceps nasutus* SSF 183.15. C1. PEM 6808 - L. 3.6 mm OD, 104 mm TL. C2. PEM 6806 - L. 12.1 mm OD, 547 mm TL. C3. PEM 1970 - L. 21.0 mm OD, 1740 mm FL. D. *Diplodus cervinus hottentotus* SSF 183.16. D1. PEM 2616 (RUSI 12511) - L. 2.95 mm OD, 73 mm TL. D2. PEM 6016 - L. 4.0 mm OD, 101 mm TL. D3. PEM 7430 - R. 10.2 mm OD, 390 mm TL. E. *D. sargus capensis* SSF 183.17. E1. PEM 1420 - L. 1.52 mm OD, 33 mm TL. E2. PEM 1202 - L. 3.87 mm OD, 112 mm TL. E3. PEM 3859 (RUSI 12032) - R. 6.24 mm OD, 207 mm TL. E4. PEM 6200 - R. 8.20 mm OD, 312 mm TL. Scale bars 1 mm (—).

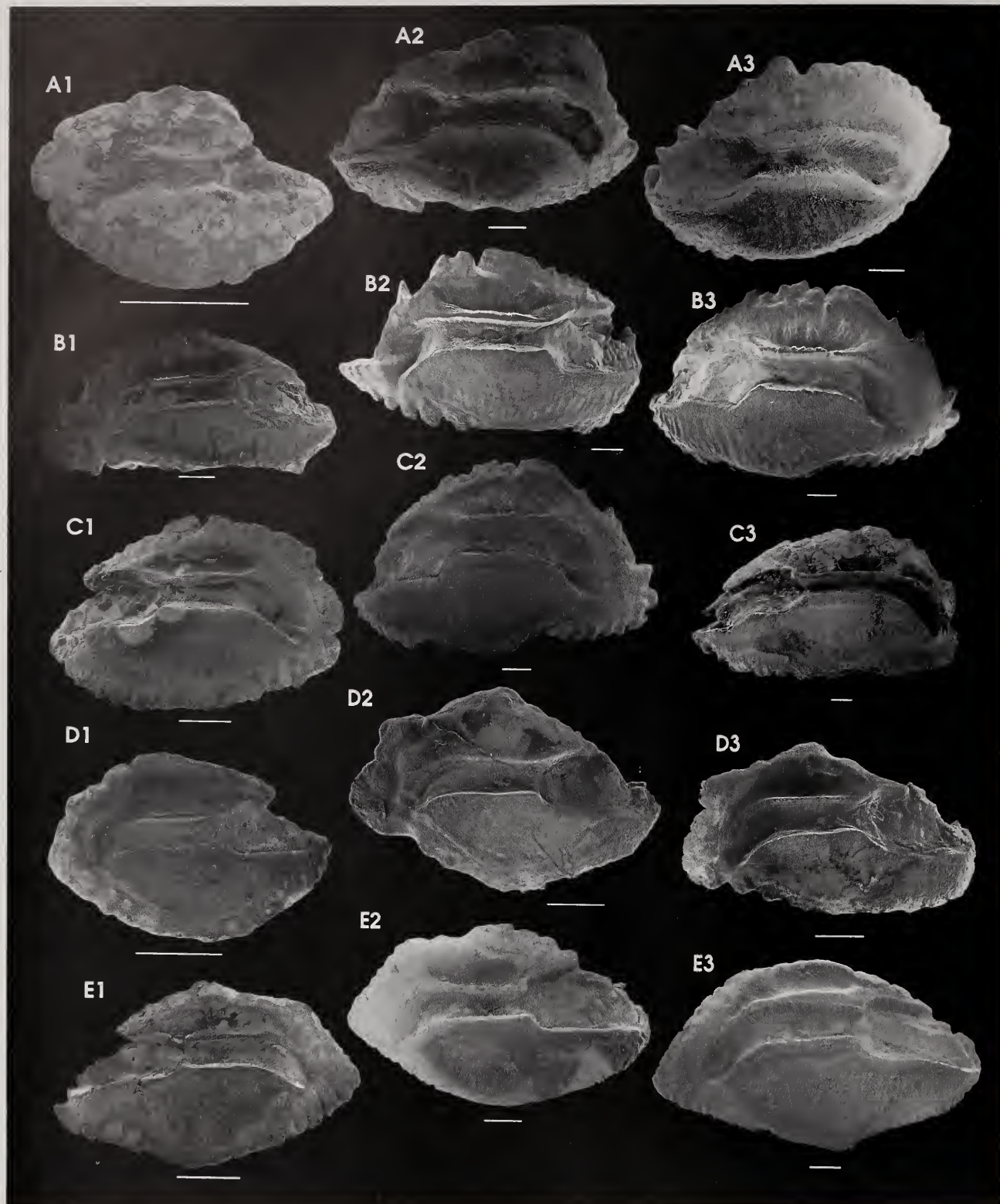


Plate 87. SPARIDAE 322 ctd. A. *Gymnocrotaphus curvidens* SSF 183.18. A1. PEM 7714 - L. 2.4 mm OD, 54 mm TL. A2. PEM 11346 - R. 9.7 mm OD, 315 mm TL. A3. PEM 14814 - R. 10.16 mm OD, 379 mm TL. B. *Lithognathus aureti* SSF 183.19. B1. PEM 1804 - L. 9.72 mm OD, 375 mm TL. B2. PEM 1800 - L. 10.72 mm OD, 420 mm TL. B3. PEM 1793 - R. 11.94 mm OD, 550 mm TL. C. *L. lithognathus* SSF 183.20. C1. PEM 1323 - R. 6.33 mm OD, 230 mm TL. C2. PEM 1226 - R. 10.6 mm OD, 395 mm TL. C3. PEM 5723 - R. 14.0 mm OD, 785 mm FL. D. *L. mormyrus* SSF 183.21. D1. PEM 4160 - L. 3.5 mm OD, 83 mm TL. D2. PEM 4219 - L. 5.5 mm OD, 142 mm TL. D3. PEM 7438 - L. 6.6 mm OD, 223 mm TL. E. *Pachymetopon aeneum* SSF 183.22. E1. PEM 5628 - R. 5.28 mm OD, 120 mm TL. E2. PEM 10261 - L. 9.1 mm OD, 268 mm TL. E3. PEM 9630 - L. 11.8 mm OD, 430 mm TL. Scale bars 1 mm (—).



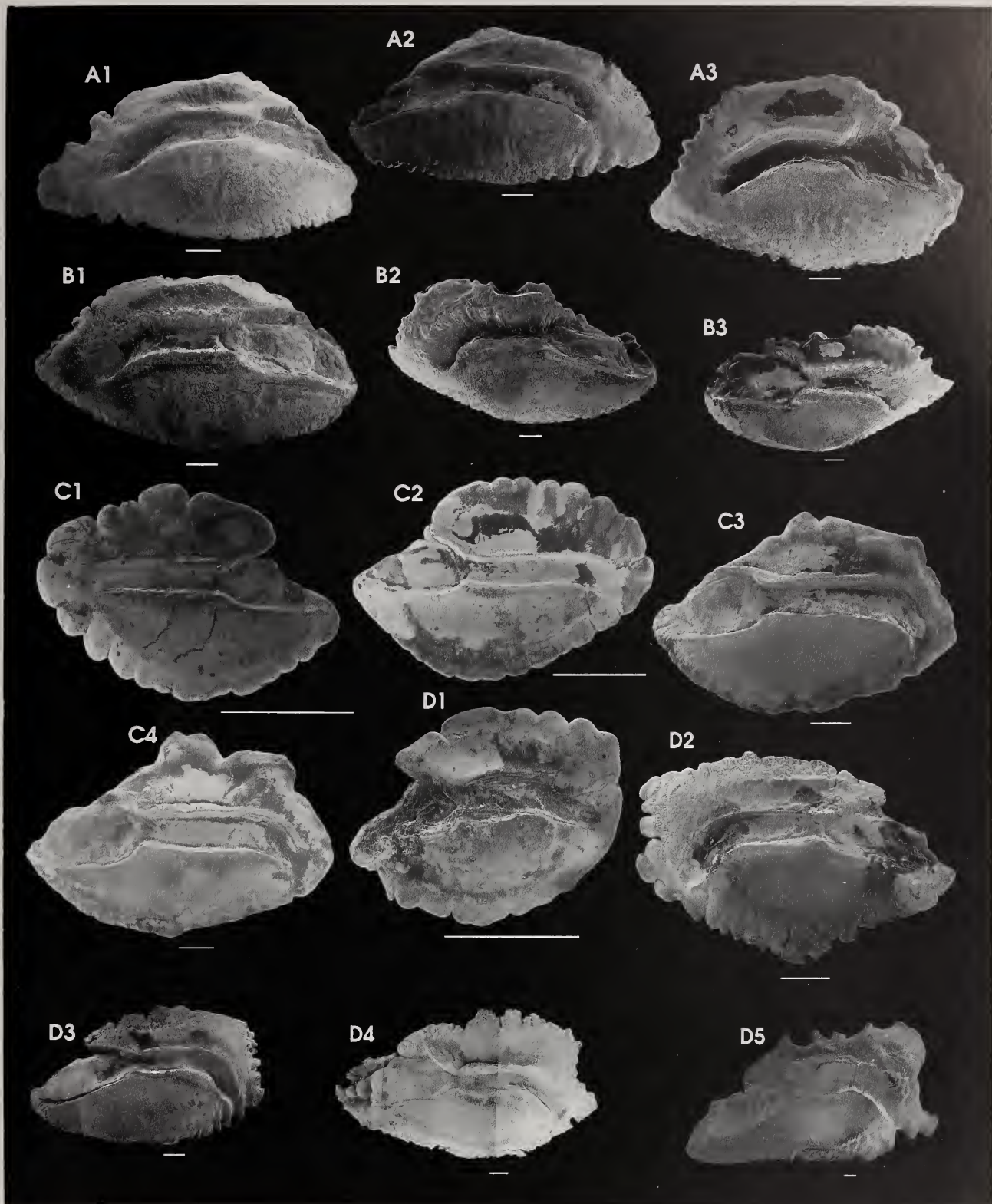


Plate 88. SPARIDAE 322 ctd. A. *Pachymetopon blochii* SSF 183.23. A1. PEM 2090 - L. 10.42 mm OD, 320 mm TL. A2. PEM 2193 - R. 10.68 mm OD, 324 mm TL. A3. PEM 11991 (RUSI 27030) - L. 11.2 mm OD, 385 mm TL. B. *P. grande* SSF 183.24. B1. PEM 8779 - L. 11.0 mm OD, 352 mm TL. B2. PEM 15119 - L. 12.74 mm OD, 447 mm FL. B3. PEM 5370 - R. 14.0 mm OD, 485 mm TL. C. *Pagellus bellottii natalensis* SSF 183.25. C1. PEM 4243 - L. 1.98 mm OD, 44 mm TL. C2. PEM 3196 (RUSI 11619) - R. 3.32 mm OD, 72 mm TL. C3. PEM 6520 - R. 7.3 mm OD, 172 mm TL. C4. PEM 3198 (RUSI 11619) - R. 10.1 mm OD, 227 mm TL. D. *Petrus rupestris* SSF 183.26. D1. PEM 5594 - R. 2.0 mm OD, 58 mm TL. D2. PEM 5623 - L. 6.7 mm OD, 232 mm TL. D3. PEM 15125 - R. 11.58 mm OD, 465 mm TL. D4. PEM 15129 - R. 14.86 mm OD, 825 mm TL. D5. PEM 0512 - R. 23.8 mm OD, c.1200 mm TL. Scale bars 1 mm (—).

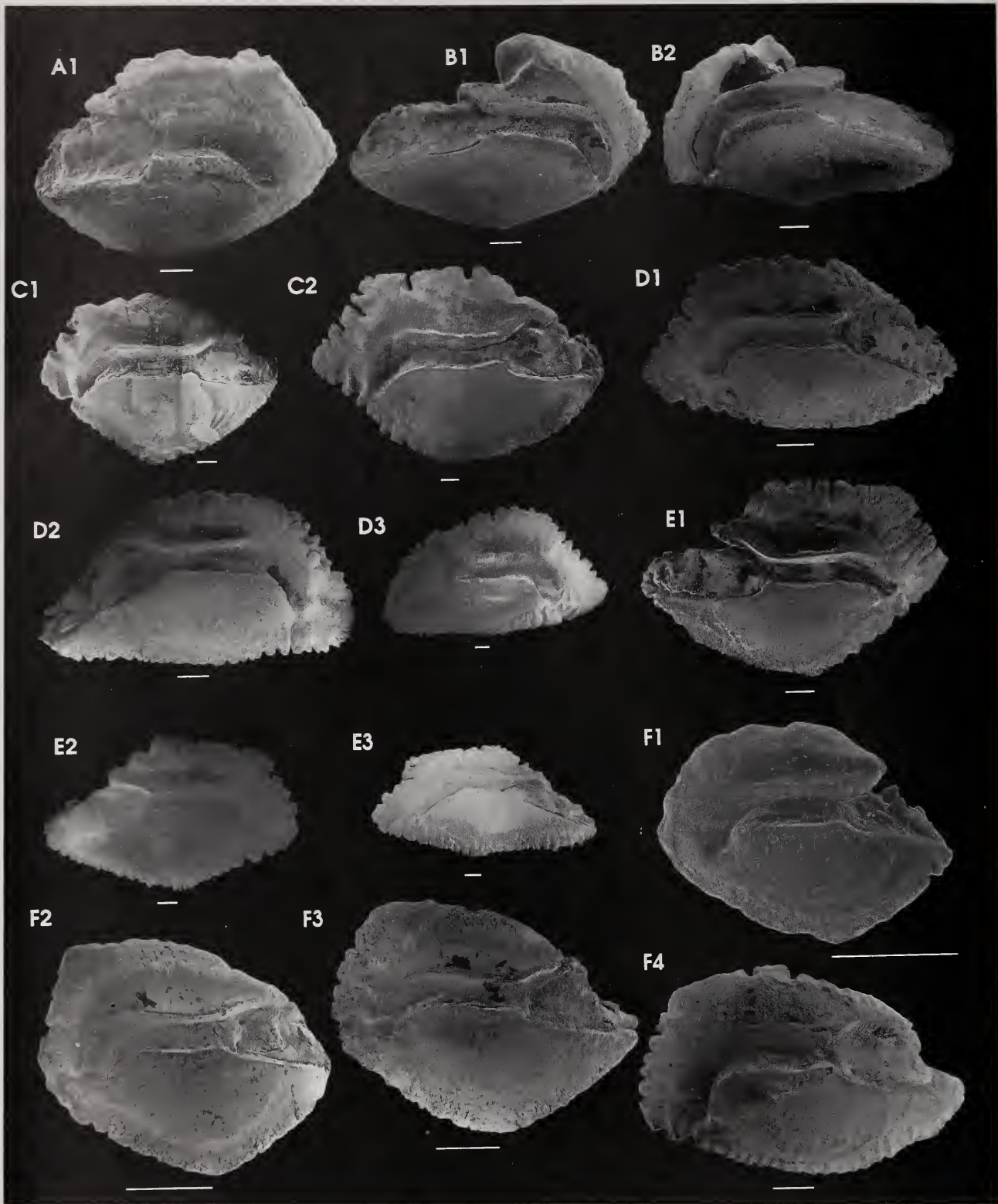


Plate 89. SPARIDAE 322 ctd. A. *Polyamblyodon germanum* SSF 183.27. A1. 1757H - R. 10.96 mm OD, 400 mm TL?. B. *P. gihbosum* SSF 183.28. B1. 1756H - R. 10.98 mm OD, 390 mm TL. B2. PEM 9629 - L. 11.4 mm OD, 445 mm TL. C. *Polysteganus coeruleopunctatus* SSF 183.29. C1. PEM 2703 - L. 12.98 mm OD, c.390 mm TL. C2. PEM 2731 - L. 16.92 mm OD, 407 mm TL. D. *P. praeorbitalis* SSF 183.31. D1. PEM 10330 - L. 9.7 mm OD, 326 mm TL. D2. PEM 6229 - R. 11.8 mm OD, 515 mm TL. D3. PEM 2851 - R. 17.46 mm OD, 893 mm TL. E. *P. undulosus* SSF 183.32. E1. PEM 11756 - R. 11.8 mm OD, 315 mm FL. E2. PEM 11758 - R. 13.8 mm OD, 420 mm FL. E3. PEM 11763 - L. 14.9 mm OD, 497 mm FL. F. *Porcostoma dentata* SSF 183.33. F1. PEM 4102 - L. 2.5 mm OD, 57 mm TL. F2. PEM 5471 - L. 3.5 mm OD, 96 mm TL. F3. PEM 7528 (RUSI 21233) - L. 5.3 mm OD, 143 mm TL. F4. PEM 7501 - L. 8.3 mm OD, 285 mm TL. Scale bars 1 mm (—).



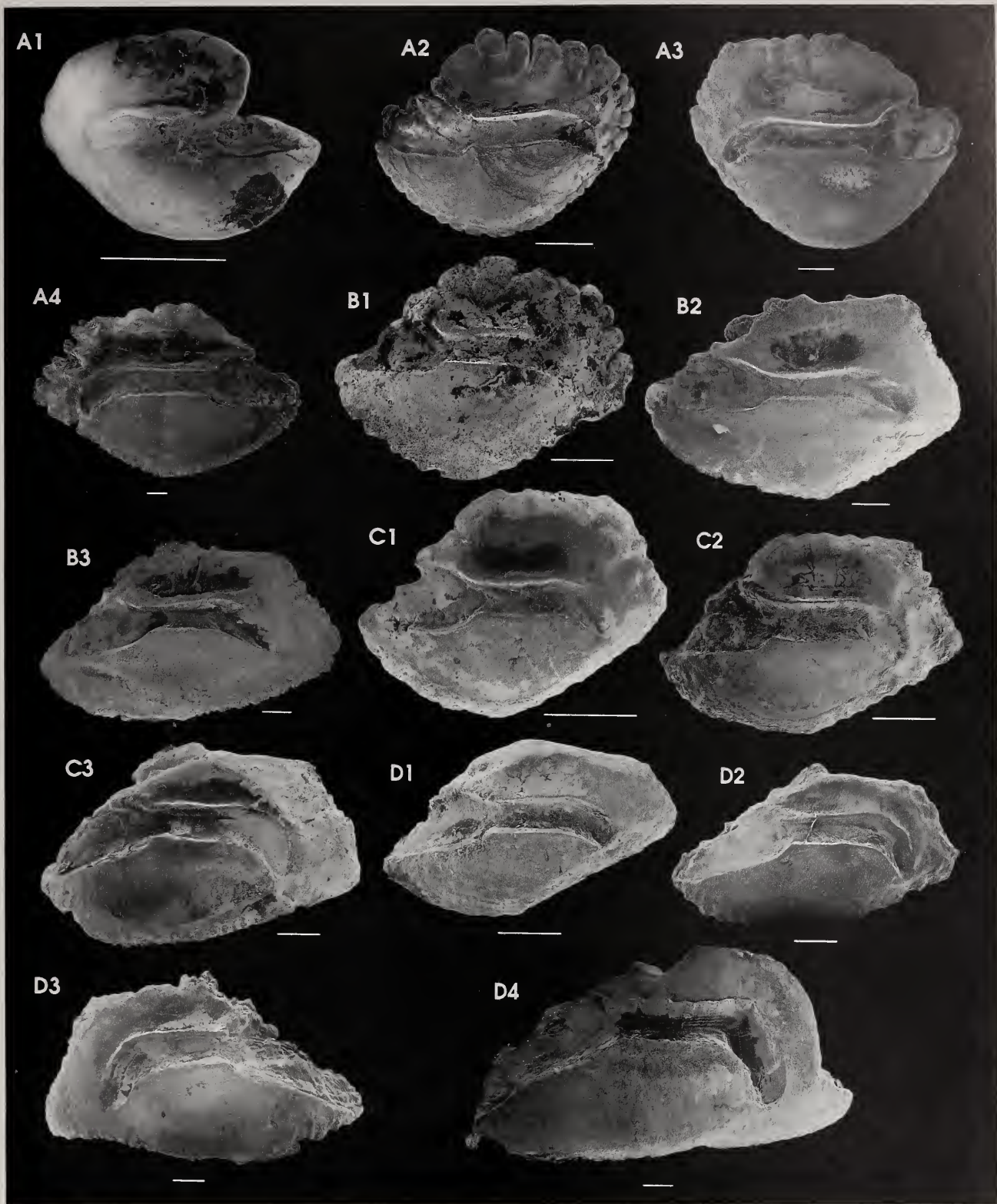


Plate 90. SPARIDAE 322 ctd. A. *Pterogymnus lanarius* SSF 183.34. A1. PEM 5455 - L. 2.22 mm OD, 46 mm TL. A2. PEM 11644 - R. 5.0 mm OD, 98 mm TL. A3. PEM 3086 (RUSI 11636) - L. 8.2 mm OD, 183 mm TL. A4. PEM 8601 - L. 13.8 mm OD, 342 mm TL. B. *Rhabdosargus globiceps* SSF 183.35. B1. PEM 1311 - R. 5.19 mm OD, 139 mm TL. B2. PEM 2171 (RUSI 11450) - R. 9.7 mm OD, 272 mm TL. B3. PEM 11376 - R. 11.5 mm OD, 375 mm TL. C. *R. holubi* SSF 183.36. C1. PEM 5434 - R. 3.4 mm OD, 88 mm TL. C2. PEM 3860 (RUSI 11956) - R. 4.41 mm OD, 124 mm TL. C3. PEM 1147 - R. 8.39 mm OD, 267 mm TL. D. *R. sarba* SSF 183.37. D1. PEM 0017 - R. 4.8 mm OD, c.90 mm FL. D2. PEM 9605 - R. 7.0 mm OD, 208 mm TL. D3. PEM 1976 - L. 11.44 mm OD, 459 mm TL. D4. PEM 6464 - R. 14.4 mm OD, 590 mm FL. Scale bars 1 mm (—).

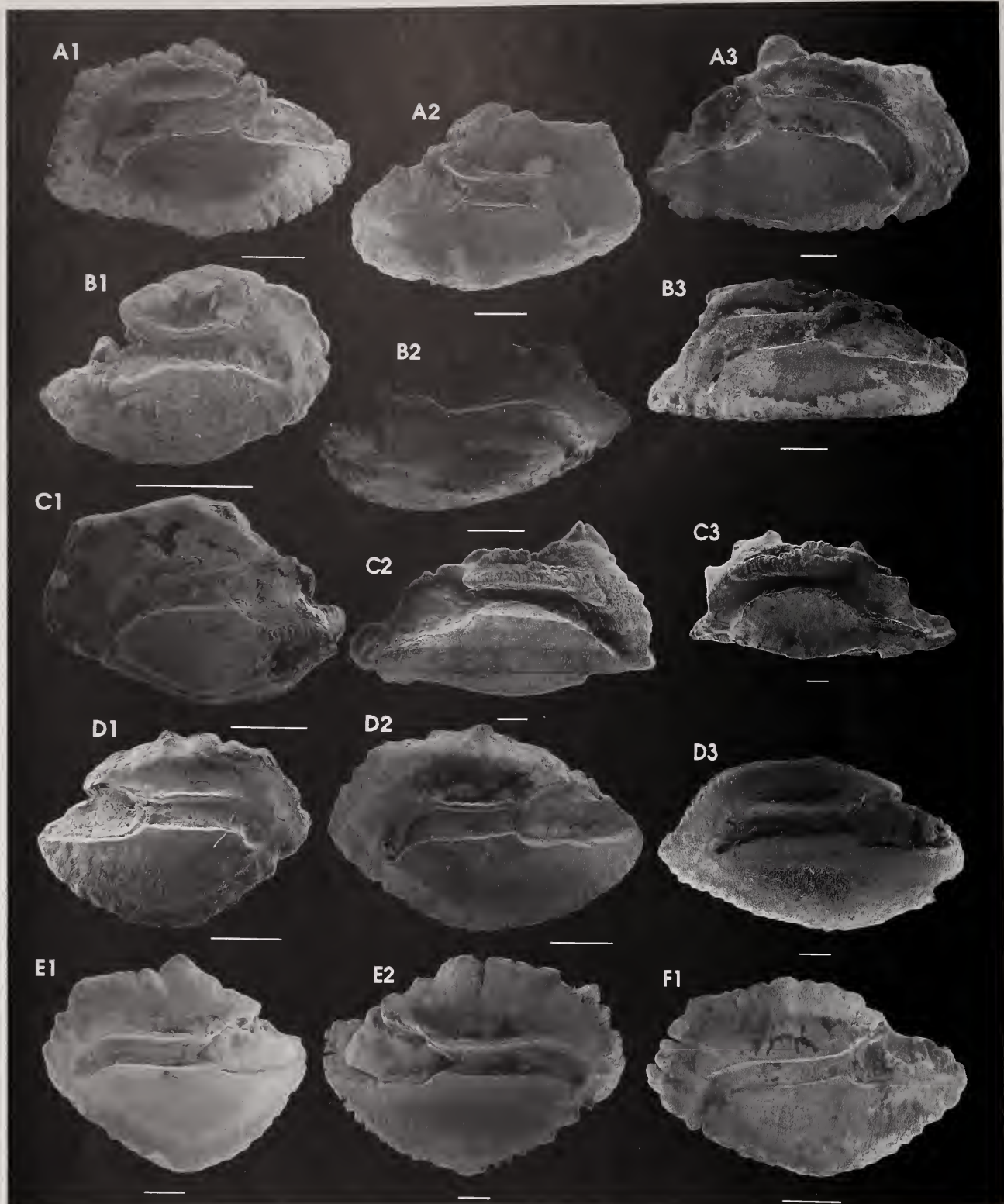


Plate 91. SPARIDAE 322 ctd. A. *Rhabdosargus thorpei* SSF 183.38. A1. PEM 6662 - L. 5.3 mm OD, 132 mm TL. A2. PEM 6734 (RUSI 28490) - R. 5.9 mm OD, 157 mm TL. A3. PEM 6114 - R. 10.56 mm OD, 277 mm FL. B. *Sarpa salpa* SSF 183.39. B1. PEM 5147 - R. 2.8 mm OD, 74 mm TL. B2. PEM 1351 - R. 6.12 mm OD, 224 mm TL. B3. PEM 1352 - L. 7.8 mm OD, 265 mm TL. C. *Sparodon durbanensis* SSF 183.40. C1. PEM 4723 - L. 4.2 mm OD, 108 mm TL. C2. PEM 6194 - R. 10.6 mm OD, 676 mm TL. C3. PEM 6385 - L. 13.4 mm OD, 950 mm TL. D. *Spondyllosoma emarginatum* SSF 183.41. D1. PEM 4211 (RUSI 12779) - R. 4.22 mm OD, 100 mm TL. D2. PEM 3271 (RUSI 11621) - L. 5.62 mm OD, 139 mm TL. D3. PEM 11996 - L. 10.5 mm OD, 335 mm TL. CENTRACANTHIDAE 323. E. *Spicara australis* SSF 184.1. E1. PEM 14987 (RUSI 35596) - L. 6.8 mm OD, 164 mm TL. E2. PEM 0620 - R. 10.72 mm OD, 275 mm TL. F. *S. axillaris* SSF 184.2. F1. PEM 11602 (RUSI 28473) - L. 5.8 mm OD, 132 mm TL. Scale bars 1 mm (—).



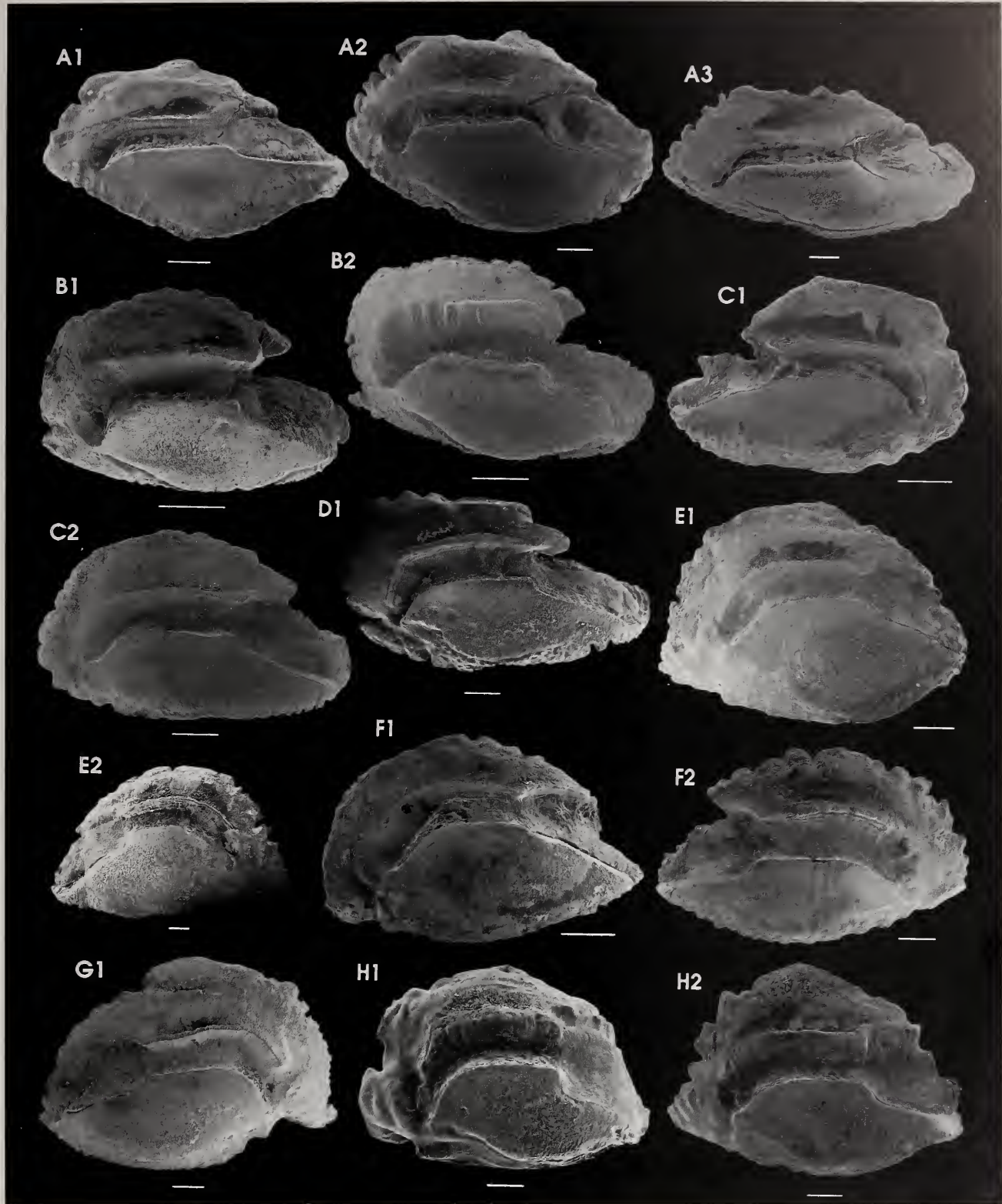


Plate 92. CENTRACANTHIDAE 323 ctd. A. *Spicara axillaris* SSF 184.2. A1. PEM 12212 - L. 7.5 mm OD, 180 mm TL. A2. PEM 12556 (RUSI 28378) - L. 9.7 mm OD, 260 mm TL. A3. PEM 12211 - L. 12.0 mm OD, 307 mm TL. LETHRINIDAE 324. B. *Gnathodentex aureolineatus* SSF 185.1. B1. PEM 15671 - L. 4.95 mm OD, 200 mm TL. B2. PEM 14532 (RUSI 31466) - L. 5.9 mm OD, 284 mm TL. C. *Gymnocranius griseus* SSF 185.2. C1. PEM 8544 (RUSI 34074) - R. 5.7 mm OD, 175 mm TL. C2. PEM 14542 - L. 7.7 mm OD, 300 mm TL. D. *G. robinsoni* SSF 185.3. D1. PEM 8510 - L. 10.0 mm OD, 450 mm TL. E. *Lethrinus crocineus* SSF 185.5. E1. PEM 8334 - L. 8.2 mm OD, 250 mm TL. E2. PEM 8373 - R. 12.6 mm OD, 455 mm TL. F. *L. elongatus* SSF 185.6. F1. PEM 8505 - L. 6.1 mm OD, 198 mm TL. F2. PEM 8490 - R. 9.2 mm OD, 345 mm TL. G. *L. mahsena* SSF 185.11. G1. 1357H - R. 10.28 mm OD, 424 mm TL. H. *L. mahsenoides* SSF 185.12. H1. PEM 8308 (RUSI 34155) - L. 8.6 mm OD, 241 mm TL. H2. PEM 8461 (RUSI 37498) - L. 9.8 mm OD, 280 mm TL. Scale bars 1 mm (—).

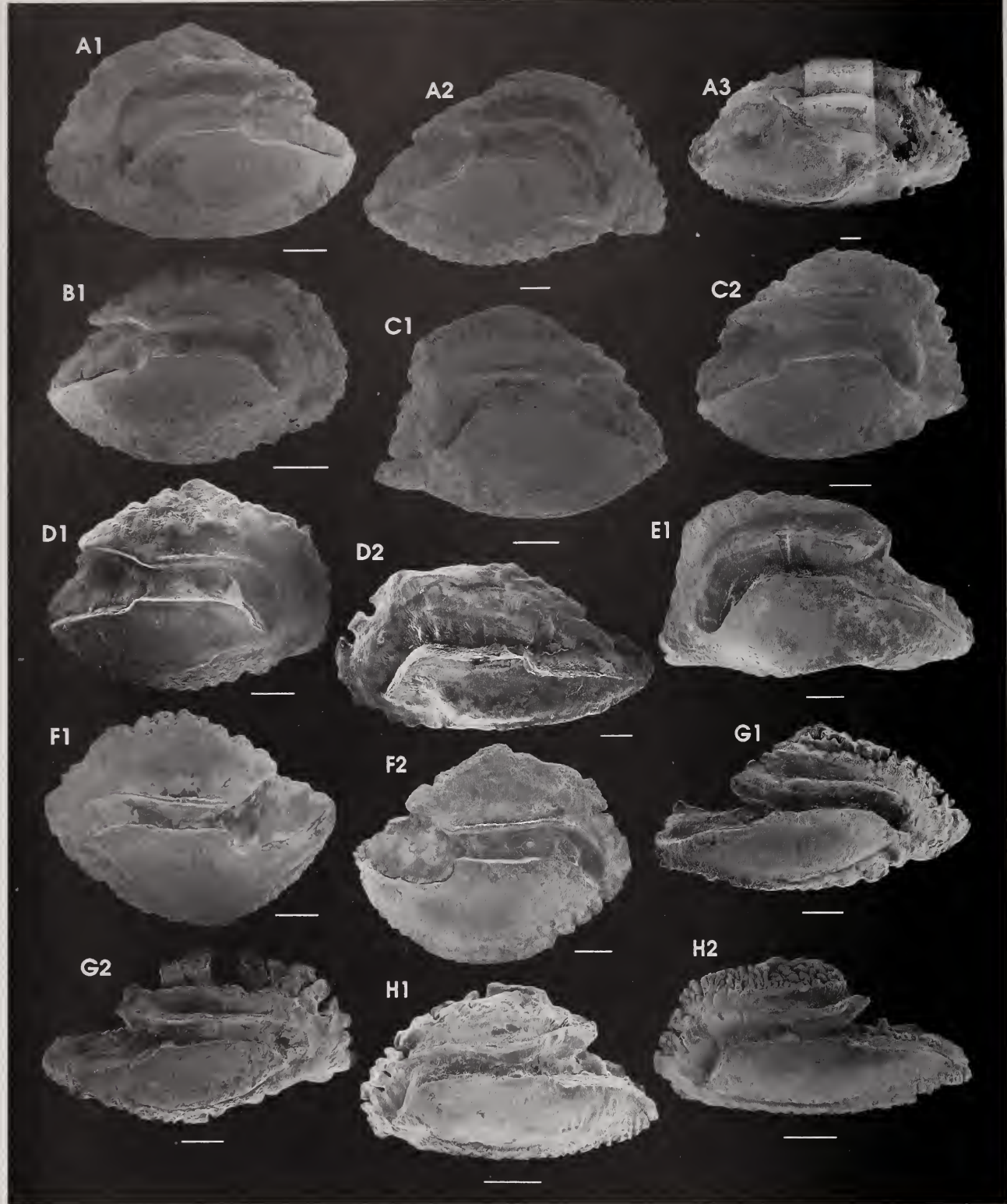


Plate 93. LETHRINIDAE 324 etd. A. *Lethrinus nebulosus* SSF 185.13. A1. PEM 14549 (RUSI 31467) - L. 7.8 mm OD, 250 mm TL. A2. PEM 8194 - R. 11.8 mm OD, 418 mm TL. A3. PEM 7436 - R. 15.0 mm OD, 625 mm TL. B. *L. rubrioperculatus* SSF 185.15. B1. PEM 14524 (RUSI 31462) - R. 5.8 mm OD, 197 mm TL. C. *L. sanguineus* SSF 185.16. C1. PEM 14548 - L. 6.7 mm OD, 225 mm TL. C2. PEM 14547 (RUSI 31432) - R. 7.4 mm OD, 246 mm TL. D. *L. variegatus* SSF 185.17. D1. PEM 8530 (RUSI 37469) - R. 7.1 mm OD, 270 mm TL. D2. PEM 8202 (RUSI 37464) - L. 8.4 mm OD, 295 mm TL. E. *Monotaxis grandoculis* SSF 185.19. E1. PEM 7434 - L. 9.5 mm OD, 507 mm TL. NEMIPTERIDAE 325. F. *Nemipterus bipunctatus* SSF 186.1. F1. PEM 0401 - L. 7.2 mm OD, 184 mm TL. F2. PEM 0400 - R. 7.88 mm OD, 212 mm TL. G. *Parascolopsis eriomma* SSF 186.3. G1. PEM 15551 (RUSI 42680) - R. 7.84 mm OD, 265 mm TL. G2. PEM 15550 (RUSI 42680) - R. 8.28 mm OD, 257 mm TL. H. *Scolopsis vosmeri* SSF 186.6. H1. PEM 4357 - L. 5.38 mm OD, 193 mm TL. H2. PEM 6168 (RUSI 17194) - L. 6.4 mm OD, 207 mm TL. Scale bars 1 mm (—).



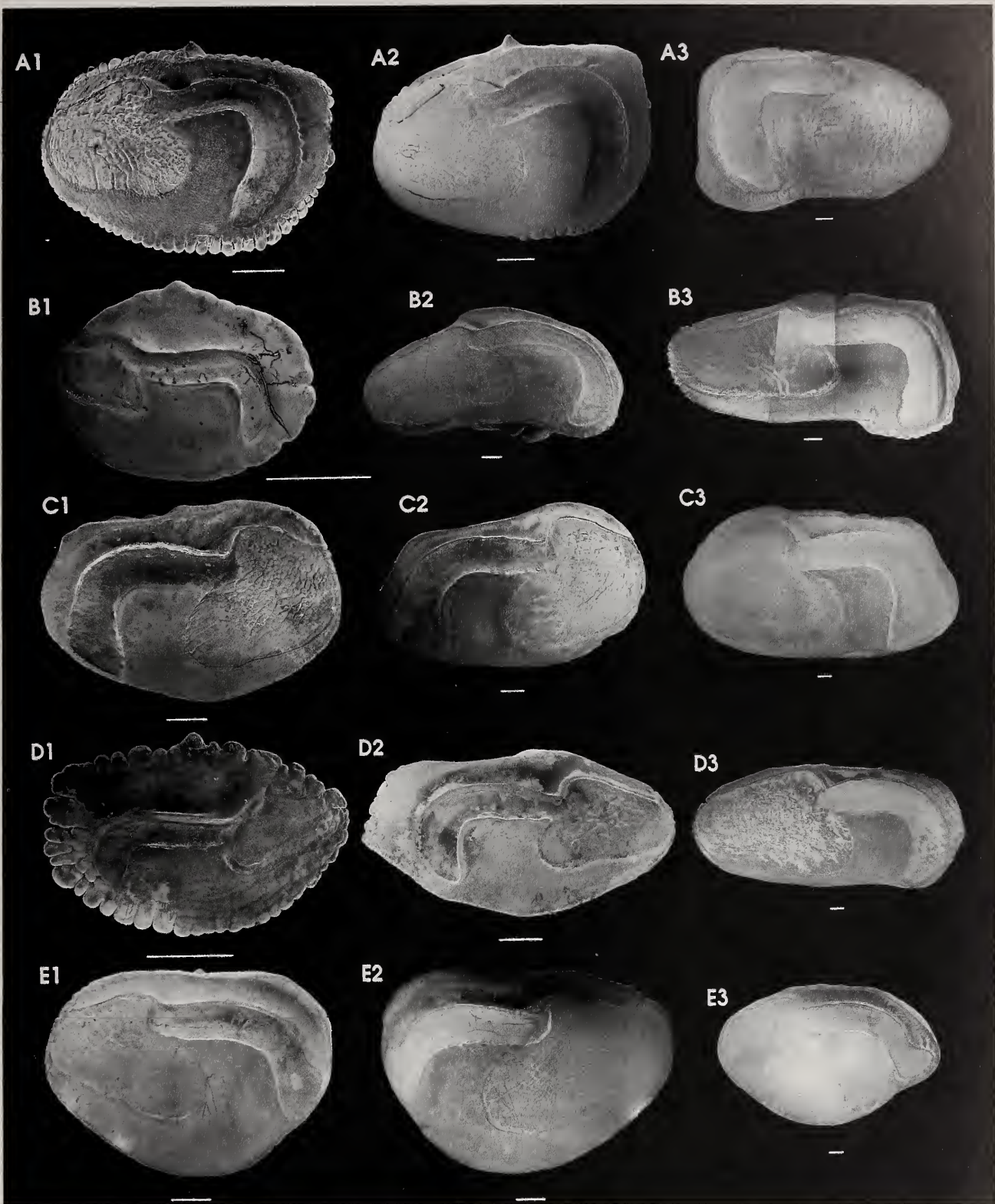


Plate 94. SCIAENIDAE 326. A. *Argyrosomus hololepidotus* A SSF 199.1A. A1. PEM 1706 - R. 6.0 mm OD, 141 mm TL. A2. PEM 8694 - R. 8.1 mm OD, 225 mm TL. A3. PEM 5374 - L. 31.4 mm OD, 1348 mm TL. B. *A. hololepidotus* B SSF 199.1B. B1. PEM 3574 - R. 2.7 mm OD, 47 mm TL. B2. PEM 4190 (RUSI 12765) - R. 13.94 mm OD, 389 mm TL. B3. PEM 1820 - R. 17.6 mm OD, 595 mm TL. C. *A. thorpei* SSF 199.2. C1. PEM 7736 (RUSI 28382) - L. 8.4 mm OD, 165 mm TL. C2. PEM 7739 (RUSI 28382) - L. 12.4 mm OD, 277 mm TL. C3. PEM 5804 - R. 21.2 mm OD, 682 mm TL. D. *Atractoscion aequidens* SSF 199.3. D1. PEM 4853 - L. 3.7 mm OD, 71 mm TL. D2. PEM 3662 - L. 7.29 mm OD, 181 mm TL. D3. PEM 5791 - R. 21.7 mm OD, 965 mm TL. E. *Atrobucca nibe* SSF 199.4. E1. PEM 0635 - R. 7.88 mm OD, 142 mm TL. E2. PEM 0239 - L. 11.69 mm OD, c.220 mm TL. E3. PEM 9777 - R. 16.8 mm OD, 393 mm TL. Scale bars 1 mm (—).

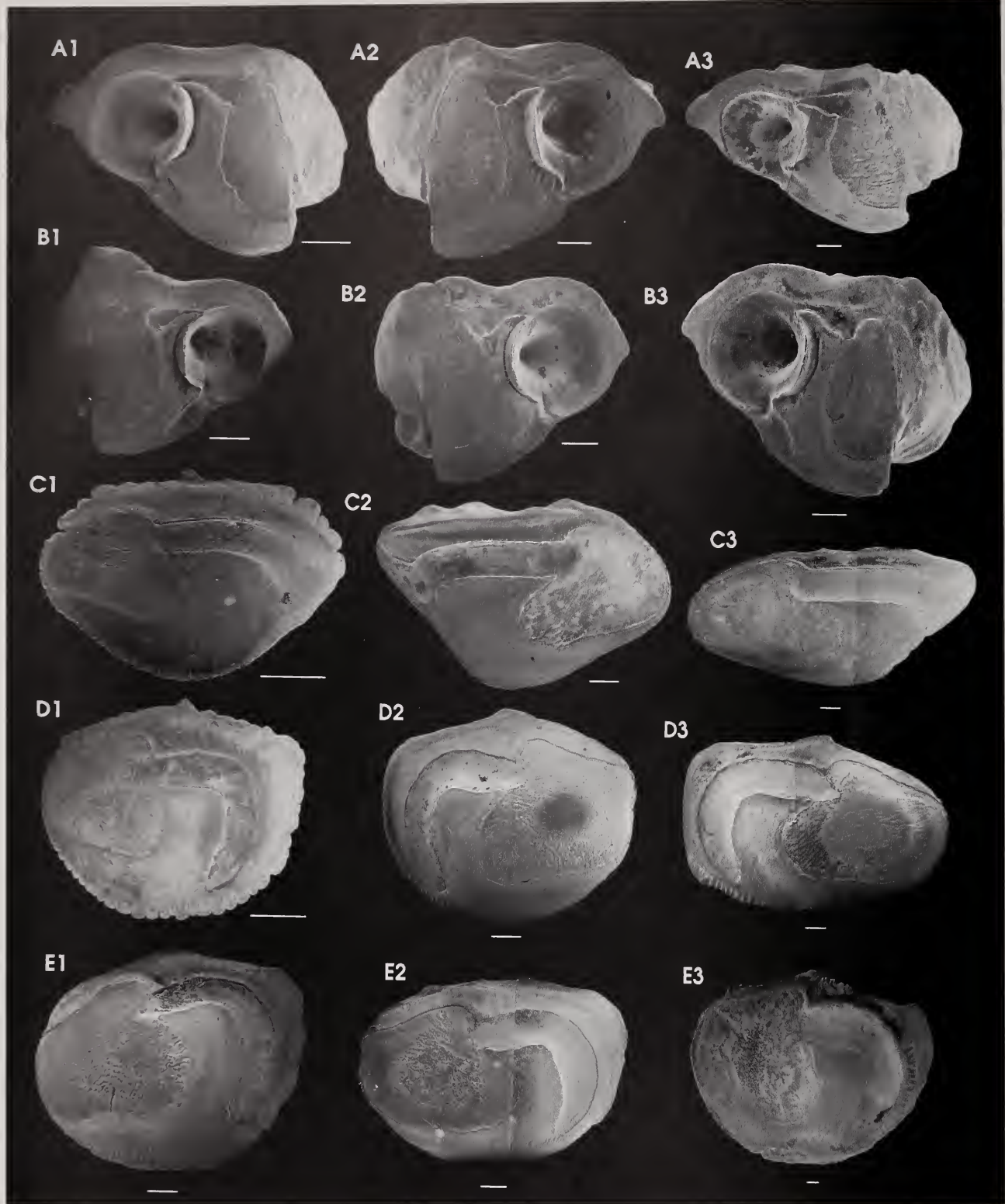


Plate 95. SCIAENIDAE 326 ctd. A. *Johnius amblycephalus* SSF 199.5. A1. PEM 15322 (RUSI 36867) - R. 6.52 mm OD, 103 mm TL. A2. PEM 15321 (RUSI 36867) - L. 9.94 mm OD, 180 mm TL. A3. PEM 15320 (RUSI 36867) - R. 12.08 mm OD, 225 mm TL. B. *J. dussumieri* SSF 199.6. B1. PEM 15278 (RUSI 36869) - L. 5.72 mm OD, 123 mm TL. B2. PEM 15277 (RUSI 36869) - L. 7.72 mm OD, 148 mm TL. B3. PEM 15324 (RUSI 36866) - R. 9.44 mm OD, 175 mm TL. C. *Otolithes ruber* SSF 199.7. C1. PEM 1722 - R. 5.3 mm OD, 106 mm TL. C2. PEM 7738 (RUSI 28383) - L. 11.1 mm OD, 260 mm TL. C3. PEM 6068 - R. 15.2 mm OD, 405 mm TL. D. *Umbrina canariensis* SSF 199.8. D1. PEM 4292 (RUSI 12785) - R. 4.8 mm OD, 104 mm TL. D2. PEM 14878 (RUSI 35587) - L. 9.5 mm OD, 240 mm TL. D3. PEM 14875 (RUSI 35544) - L. 13.7 mm OD, 368 mm TL. E. *U. ronchus* SSF 199.9. E1. PEM 2688 - R. 11.0 mm OD, 329 mm TL. E2. PEM 14863 (RUSI 35540) - R. 11.06 mm OD, 443 mm TL. E3. PEM 14217 - R. 22.5 mm OD, 813 mm TL. Scale bars 1 mm (—).



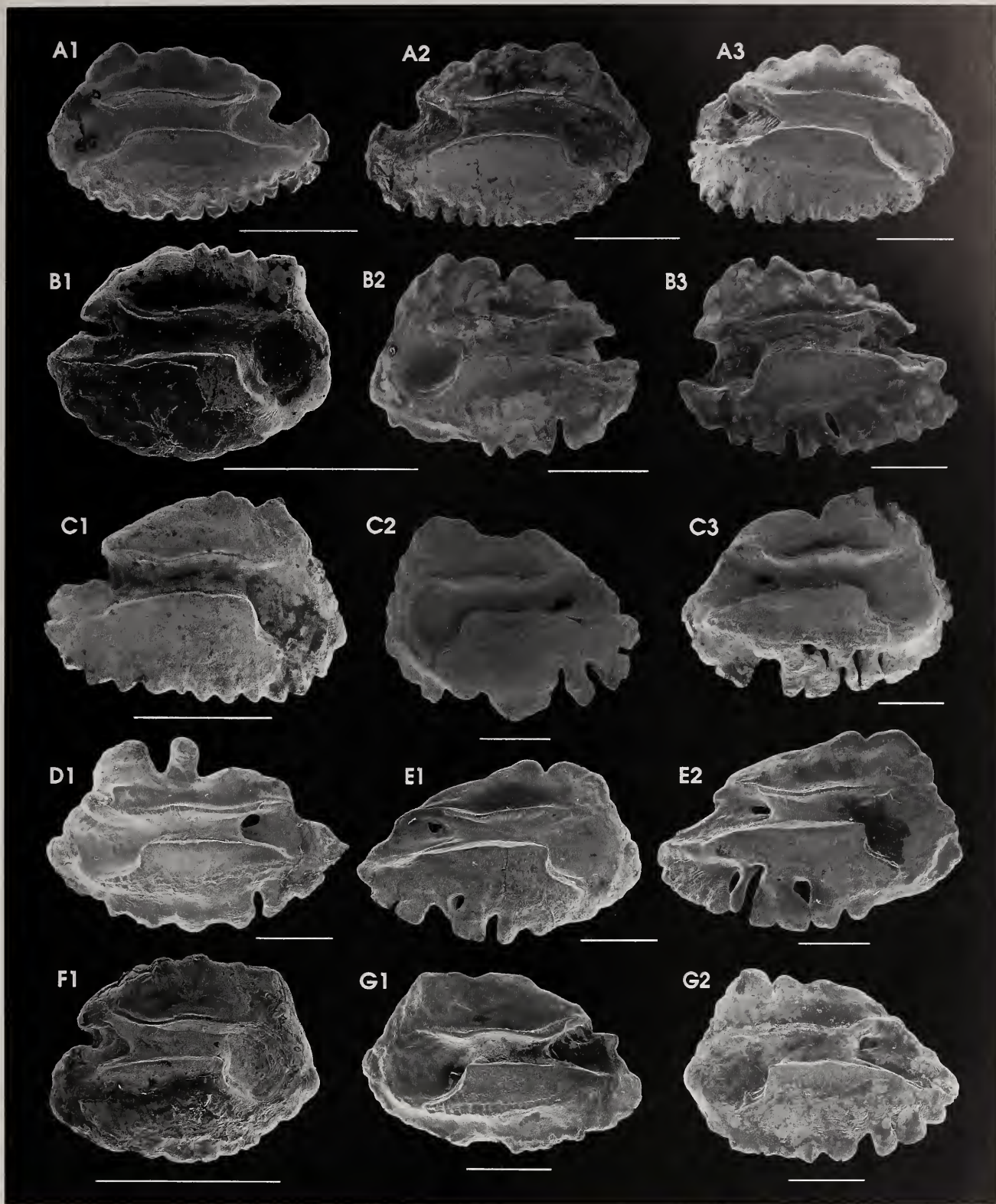


Plate 96. MULLIDAE 327. A. *Mulloidies flavolineatus* SSF 196.1. A1. PEM 15653 - L. 2.6 mm OD, 96 mm TL. A2. PEM 15643 - R. 2.7 mm OD, 118 mm TL. A3. PEM 14555 (RUSI 31422) - R. 3.6 mm OD, 200 mm TL. B. *Parupeneus barberinus* SSF 196.3. B1. PEM 15448 (RUSI 40566) - R. 1.45 mm OD, 66 mm TL. B2. 1255H - L. 2.65 mm OD, 170 mm TL. B3. 1254H - L. 3.75 mm OD, 255 mm TL. C. *P. bifasciatus* SSF 196.4. C1. PEM 15644 - R. 2.2 mm OD, 105 mm TL. C2. PEM 14534 (RUSI 31435) - L. 3.7 mm OD, 250 mm TL. C3. PEM 14530 - R. 4.5 mm OD, 286 mm TL. D. *P. cinnabarinus* SSF 196.5. D1. PEM 14528 (RUSI 31468) - L. 4.0 mm OD, 227 mm TL. E. *P. cyclostomus* SSF 196.6. E1. PEM 14526 (RUSI 31431) - R. 3.6 mm OD, 246 mm TL. E2. PEM 5688 - R. 4.4 mm OD, 253 mm FL. F. *P. indicus* SSF 196.7. F1. PEM 15444 (RUSI 40562) - R. 1.55 mm OD, 69 mm TL. G. *P. macronema* SSF 196.8. G1. PEM 8247 (RUSI 34150) - L. 3.4 mm OD, 181 mm TL. G2. PEM 6726 (RUSI 28389) - L. 3.7 mm OD, 243 mm TL. Scale bars 1 mm (—).



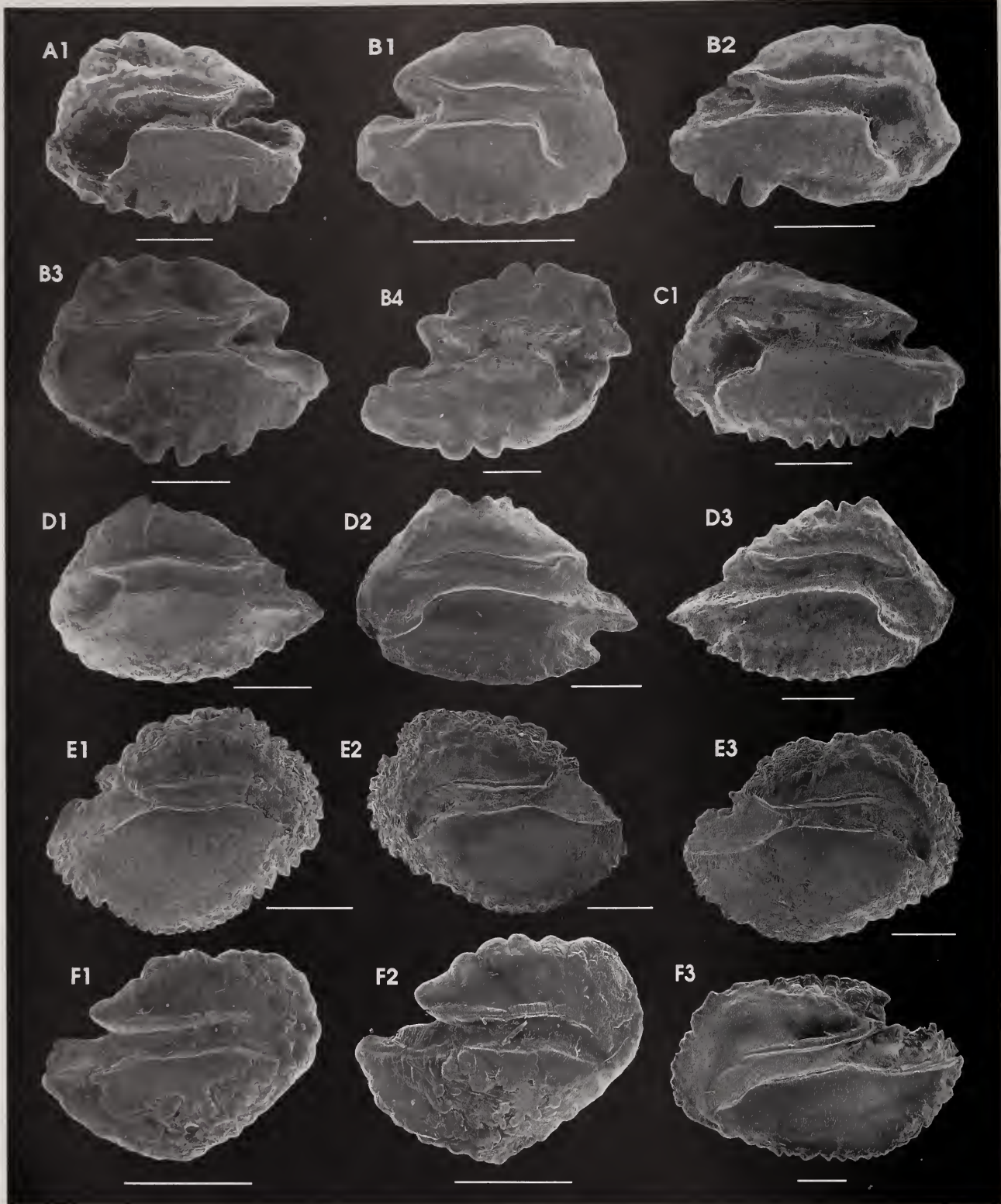


Plate 97. MULLIDAE 327 ctd. A. *Parupeneus pleurostigma* SSF 196.9. A1. PEM 9607 - L. 3.6 mm OD, 224 mm TL. B. *P. rubescens* SSF 196.10. B1. PEM 10334 - R. 1.8 mm OD, 79 mm TL. B2. PEM 6728 (RUSI 28390) - R. 3.0 mm OD, 170 mm TL. B3. PEM 14851 - L. 3.9 mm OD, 345 mm TL. B4. PEM 6038 (RUSI 17474) - R. 5.2 mm OD, 400 mm TL. C. *Upeneus tragula* SSF 196.12. C1. PEM 5068 (RUSI 13763) - L. 4.0 mm OD, 176 mm TL. D. *U. vittatus* SSF 196.13. D1. PEM 15453 (RUSI 40570) - L. 3.65 mm OD, 127 mm TL. D2. PEM 14557 (RUSI 31413) - L. 4.3 mm OD, 185 mm TL. D3. PEM 14556 (RUSI 31398) - R. 4.4 mm OD, 165 mm TL. MONODACTYLIDAE 328. E. *Monodactylus argenteus* SSF 193.1. E1. 1196H - R. 2.8 mm OD, 78 mm TL. E2. 1158H - L. 4.1 mm OD, 107 mm TL. E3. 1157H - R. 4.5 mm OD, 125 mm TL. F. *M. falciformis* SSF 193.2. F1. PEM 1243 - R. 2.45 mm OD, 52 mm TL. F2. PEM 1233 - R. 2.65 mm OD, 63 mm TL. F3. PEM 1229 - L. 6.22 mm OD, 167 mm TL. Scale bars 1 mm (—).



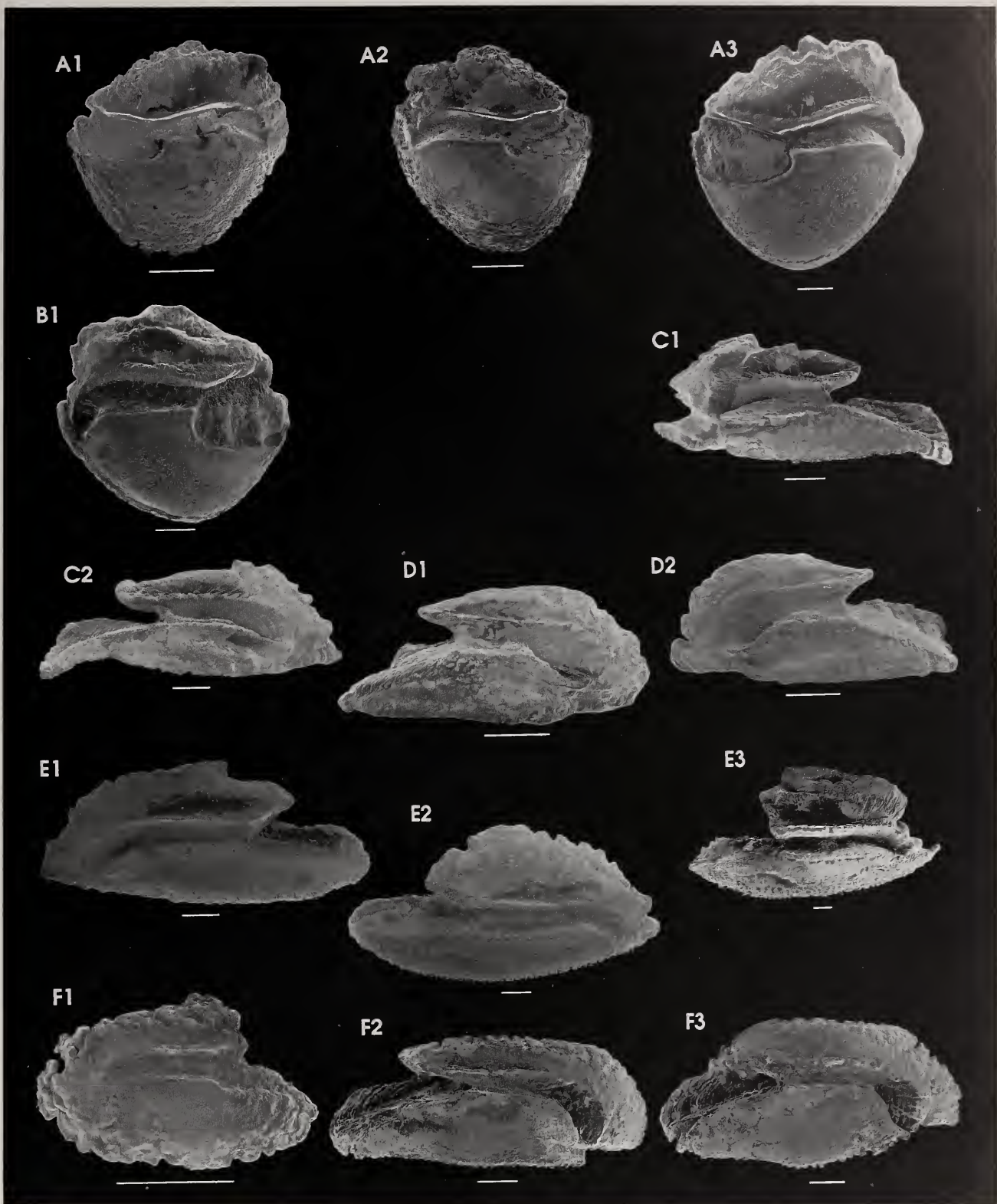


Plate 98. PEMPHERIDIDAE 329. A. *Pempheris adusta* SSF 216.2. A1. PEM 2676 - R. 3.5 mm OD, 88 mm TL. A2. PEM 2686 - L. 4.1 mm OD, 106 mm TL. A3. PEM 2672 - R. 7.18 mm OD, 184 mm TL. B. *P. mangula* SSF 216.3. B1. PEM 14265 - L. 6.2 mm OD, 170 mm TL. CORACINIDAE 333. C. *Coracinus capensis* SSF 187.1. C1. PEM 9320 - L. 8.0 mm OD, 413 mm TL. C2. PEM 10328 - R. 8.7 mm OD, 420 mm TL. D. *C. multifasciatus* SSF 187.2. D1. PEM 6736 (RUSI 28391) - R. 5.0 mm OD, 198 mm TL. D2. PEM 0604 - L. 5.28 mm OD, 202 mm TL. KYPHOSIDAE 334. E. *Parascorpius typus* SSF 188.1. E1. PEM 1653 - L. 9.88 mm OD, 310 mm TL. E2. PEM 11324 - R. 11.5 mm OD, 380 mm TL. E3. PEM 0275 - R. 14.24 mm OD, 450 mm TL. F. *Kyphosus bigibbus* SSF 189.1. F1. PEM 0809 - L. 2.5 mm OD, 87 mm TL. F2. PEM 2729 - R. 9.14 mm OD, 440 mm TL. F3. PEM 2728 - R. 9.94 mm OD, 521 mm TL. Scale bars 1 mm (—).

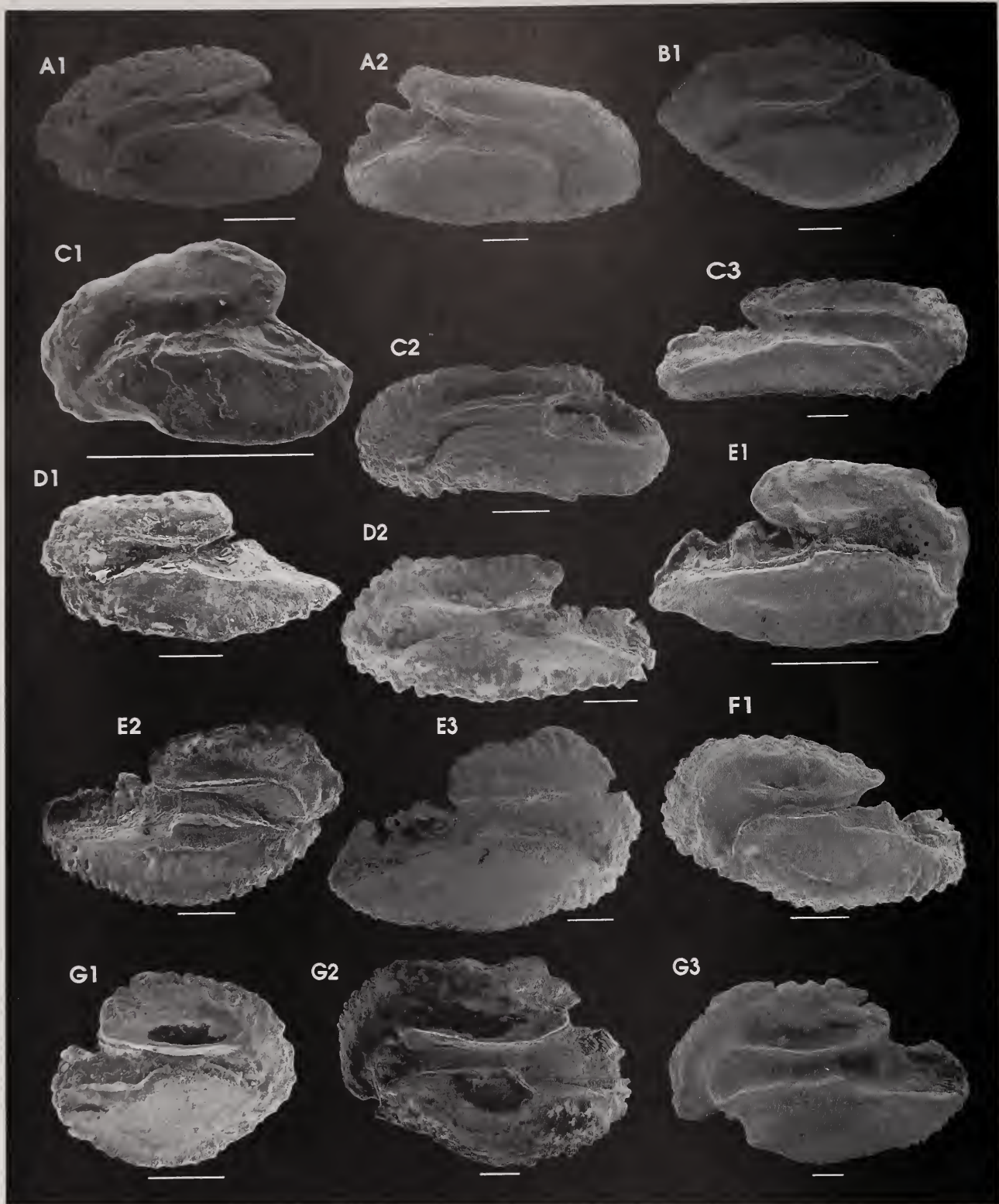


Plate 99. KYPHIOSIDAE 334 ctd. A. *Kyphosus cinerascens* SSF 189.2. A1. PEM 9280 (RUSI 35707) - L. 4.5 mm OD, 210 mm TL. A2. PEM 0421 - R. 6.98 mm OD, 380 mm TL. B. *K. vaigiensis* SSF 189.3. B1. 0203H - L. 7.96 mm OD, 240 mm TL. C. *Neoscorpis lithophilus* SSF 190.1. C1. PEM 11992 (RUSI 34122) - L. 1.5 mm OD, 45 mm TL. C2. PEM 6649 - L. 5.4 mm OD, 259 mm TL. C3. PEM 4936 - R. 8.3 mm OD, 408 mm TL. EPIHIPIPIDIDAE 335. D. *Platax orbicularis* SSF 192.1. D1. PEM 6600 - L. 4.9 mm OD, 155 mm TL. D2. PEM 6459 - L. 6.2 mm OD, 227 mm TL. E. *P. pinnatus* SSF 192.2. E1. PEM 0821 - R. 3.28 mm OD, 103 mm TL. E2. PEM 15402 (RUSI 40601) - R. 5.58 mm OD, 231 mm TL. E3. PEM 9633 - R. 7.8 mm OD, 315 mm TL. F. *Tripterodon orbis* SSF 192.4. F1. PEM 0637 - L. 5.82 mm OD, 220 mm TL. G. *Drepane longimanus* SSF 195.1. G1. PEM 15288 (RUSI 36874) - R. 3.45 mm OD, 83 mm TL. G2. PEM 1687 - L. 7.66 mm OD, 211 mm TL. G3. PEM 5469 (RUSI 15262) - L. 9.7 mm OD, 320 mm TL. Scale bars 1 mm (—).



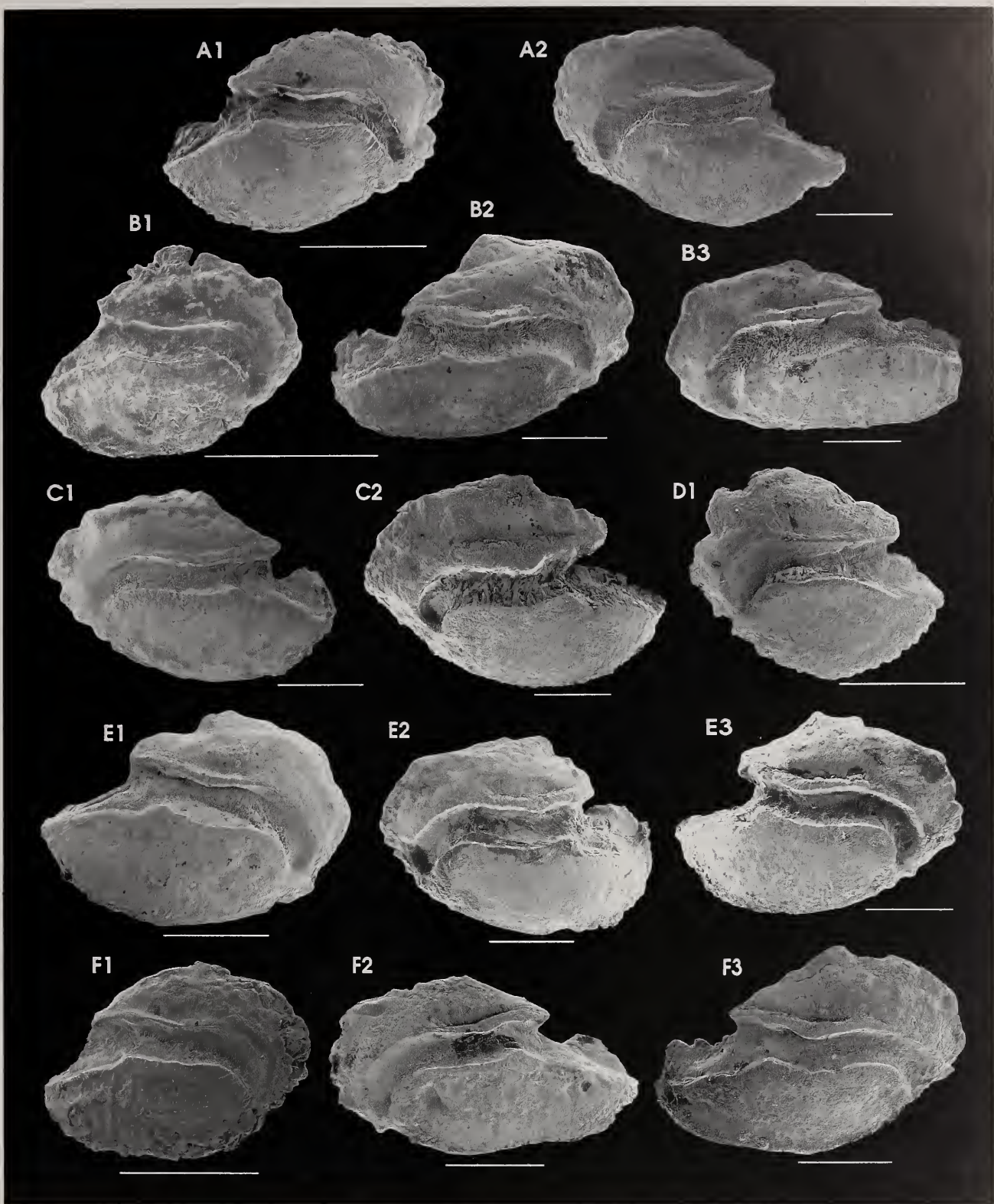


Plate 100. CHAETODONTIDAE 338. A. *Chaetodon auriga* SSF 205.1. A1. PEM 7699 - R. 2.5 mm OD, 62 mm TL. A2. PEM 6619 (RUSI 28392) - L. 3.9 mm OD, 139 mm TL. B. *C. blackburnii* SSF 205.3. B1. PEM 9282 - R. 1.6 mm OD, 45 mm TL. B2. PEM 6125 (RUSI 17188) - R. 3.8 mm OD, 103 mm TL. B3. PEM 7700 (RUSI 28393) - L. 4.0 mm OD, 115 mm TL. C. *C. dolosus* SSF 205.4. C1. PEM 4614 - L. 3.45 mm OD, 133 mm TL. C2. PEM 4370 - L. 4.2 mm OD, 111 mm TL. D. *C. falcula* SSF 205.5. D1. PEM 7697 (RUSI 28394) - L. 2.1 mm OD, 44 mm TL. E. *C. guttatissimus* SSF 205.6. E1. PEM 6621 (RUSI 28395) - R. 3.2 mm OD, 88 mm TL. E2. PEM 6602 (RUSI 28395) - L. 3.3 mm OD, 98 mm TL. E3. PEM 6126 (RUSI 17189) - R. 3.5 mm OD, 103 mm TL. F. *C. kleinii* SSF 205.7. F1. PEM 4618 - R. 1.9 mm OD, 60 mm TL. F2. PEM 4371 - L. 3.15 mm OD, 105 mm TL. F3. PEM 6620 (RUSI 28396) - R. 3.3 mm OD, 105 mm TL. Scale bars 1 mm (—).



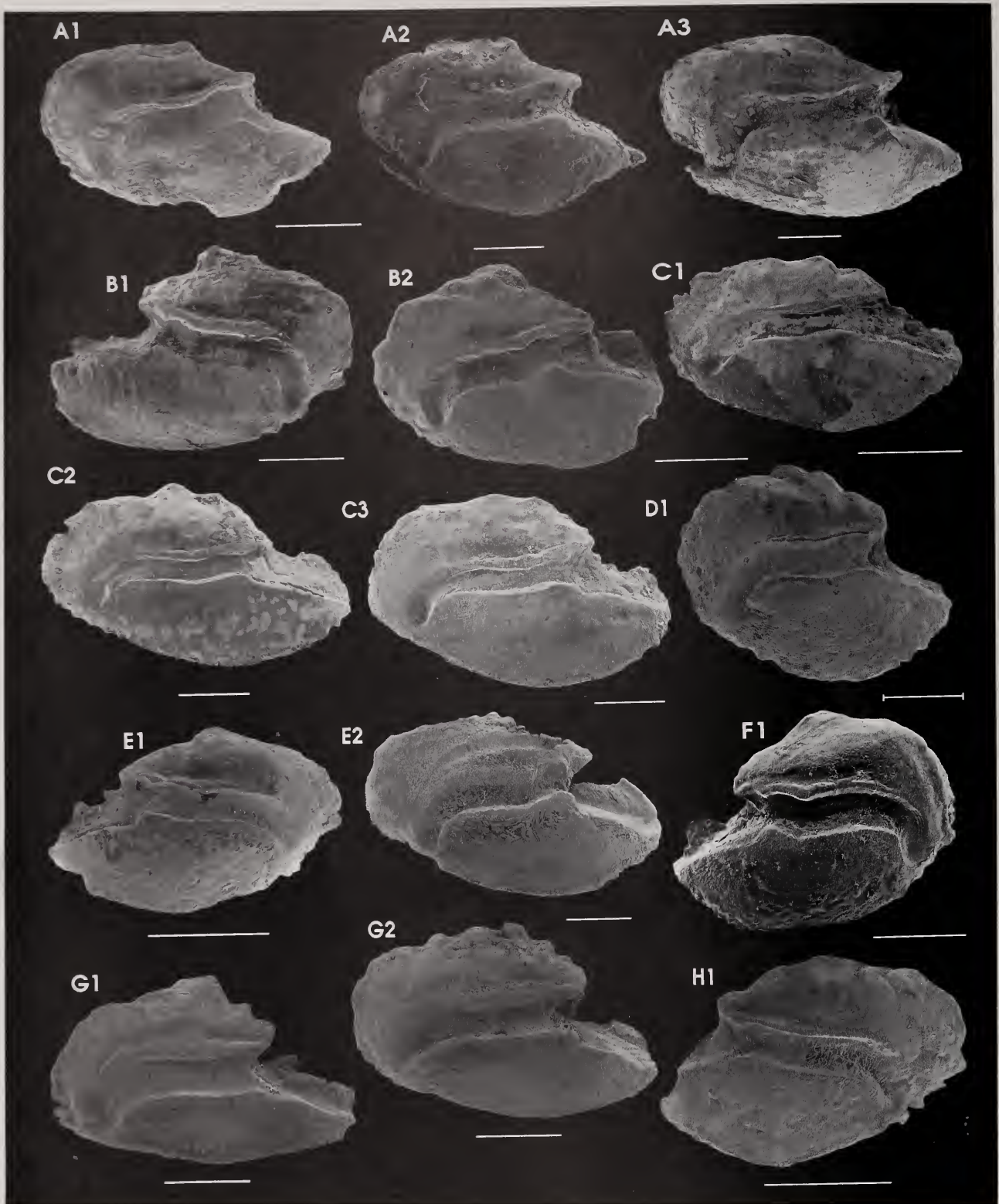


Plate 101. CHAETODONTIDAE 338 ctd. A. *Chaetodon lunula* SSF 205.9. A1. PEM 9327 - L. 3.4 mm OD, 122 mm TL. A2. PEM 6616 - L. 4.1 mm OD, 150 mm TL. A3. PEM 6597 - L. 5.4 mm OD, 200 mm TL. B. *C. madagaskariensis* SSF 205.10. B1. PEM 6124 (RUSI 17192) - L. 3.2 mm OD, 96 mm TL. B2. PEM 6751 - R. 4.0 mm OD, 109 mm TL. C. *C. marleyi* SSF 205.11. C1. PEM 4058 - L. 2.95 mm OD, 66 mm TL. C2. PEM 10331 - L. 4.4 mm OD, 105 mm TL. C3. PEM 15204 - L. 4.6 mm OD, 112 mm TL. D. *C. melannotus* SSF 205.12. D1. PEM 7695 (RUSI 28398) - L. 2.0 mm OD, 45 mm TL. E. *C. meyeri* SSF 205.13. E1. PEM 11315 - R. 2.8 mm OD, 62 mm TL. E2. PEM 6655 (RUSI 28399) - L. 4.6 mm OD, 159 mm TL. F. *C. mitratus* SSF 205.-. F1. PEM 14565 (RUSI 31443) - R. 3.2 mm OD, 100 mm TL. G. *C. trifascialis* SSF 205.14. G1. 0984H - L. 3.7 mm OD, 140 mm TL. G2. PEM 8591 (RUSI 37447) - L. 3.8 mm OD, 135 mm TL. H. *C. trifasciatus* SSF 205.15. H1. PEM 0091 - R. 2.7 mm OD, 60 mm TL. Scale bars 1 mm (—) or 0.5 mm (⊢).



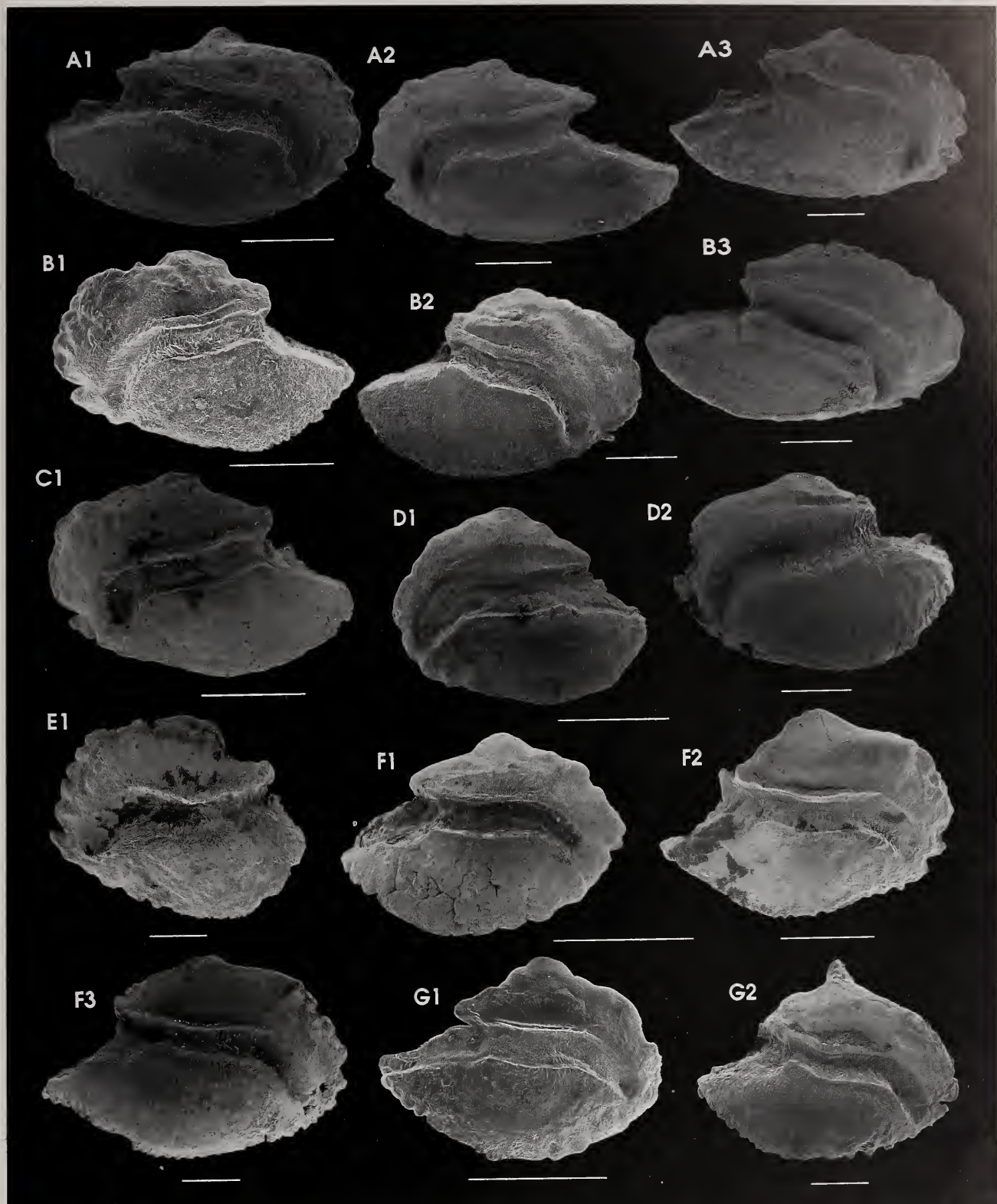


Plate 102. CHAETODONTIDAE 338 ctd. A. *Chaetodon unimaculatus* SSF 205.16. A1. PEM 8635 (RUSI 37488) - R. 3.6 mm OD, 114 mm TL. A2. PEM 6744 (RUSI 28450) - L. 4.2 mm OD, 131 mm TL. A3. PEM 9601 (RUSI 37501) - R. 5.6 mm OD, 166 mm TL. B. *C. vagabundus* SSF 205.17. B1. 0314H - L. 3.0 mm OD, 100 mm TL. B2. PEM 15410 (RUSI 40614) - R. 4.05 mm OD, 143 mm TL. B3. PEM 6656 - R. 4.7 mm OD, 171 mm TL. C. *C. xanthocephalus* SSF 205.18. C1. PEM 0018 - L. 3.1 mm OD, 63.5 mm TL. D. *Forcipiger flavissimus* SSF 205.20. D1. PEM 8870 (RUSI 37448) - L. 2.5 mm OD, 90 mm TL. D2. PEM 6707 (RUSI 28451) - L. 4.6 mm OD, 155 mm TL. E. *Hemitaurichthys zoster* SSF 205.21. E1. PEM 3927 (RUSI 12034) - L. 178 mm TL. F. *Heniochus acuminatus* SSF 205.22. F1. PEM 0373 - R. 1.7 mm OD. F2. PEM 0008 - R. 3.3 mm OD. F3. PEM 2752 - R. 5.8 mm OD, 201 mm TL. G. *H. monoceros* SSF 205.24. G1. 0318H - R. 2.0 mm OD, 50 mm TL. G2. PEM 15590 - R. 4.9 mm OD, 160 mm TL. Scale bars 1 mm (—).

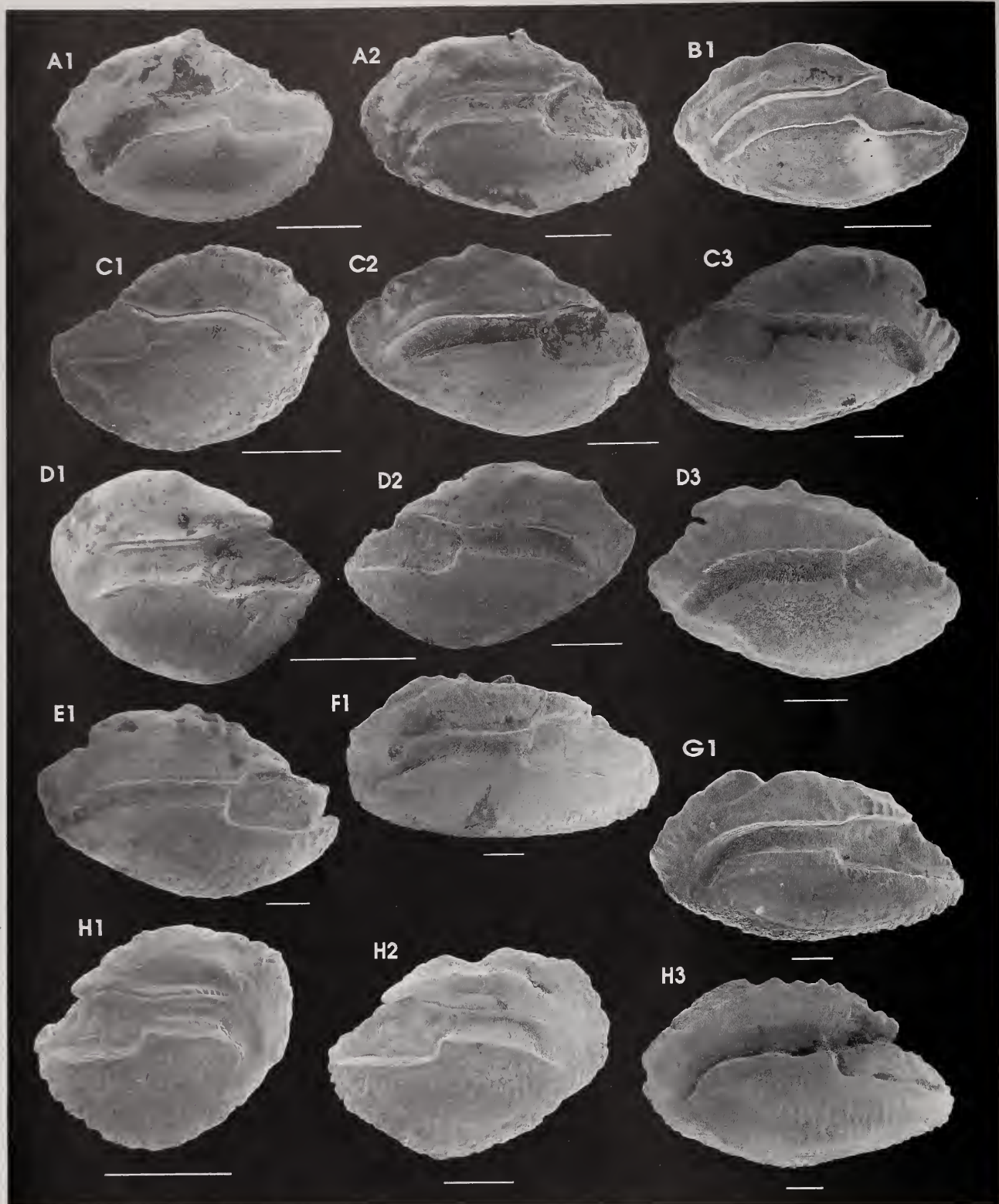


Plate 103. POMACANTHIDAE 339. A. *Apolemichthys trinaculatus* SSF 204.2. A1. 1722H - L. 3.4 mm OD. A2. PEM 0370 - L. 4.65 mm OD. B. *Centropyge acanthops* SSF 204.3. B1. PEM 6481 - L. 3.6 mm OD, 73 mm TL. C. *C. bispinosus* SSF 204.4. C1. PEM 14258 (RUSI 30680) - R. 3.0 mm OD, 53 mm TL. C2. PEM 2759 - L. 4.35 mm OD, 83 mm TL. C3. PEM 0094 - R. 6.18 mm OD, 88.8 mm TL. D. *C. multispinis* SSF 204.5. D1. PEM 8428 (RUSI 28501) - L. 2.3 mm OD, 30 mm TL. D2. PEM 3912 - R. 4.1 mm OD, 74 mm TL. D3. PEM 14794 (RUSI 31397) - L. 5.2 mm OD, 96 mm TL. E. *Genicanthus caudovittatus* SSF 204.6. E1. PEM 15720 (RUSI 42663) - L. c.7.1 mm OD, 145 mm TL. F. *Pomacanthus annularis* SSF 204.7. F1. PEM 0374 - L. 8.28 mm OD. G. *P. chrysurus* SSF 204.8. G1. PEM 15388 (RUSI 40607) - L. 7.92 mm OD, 228 mm TL. H. *P. imperator* SSF 204.9. H1. 0755H - R. 2.1 mm OD, 42 mm TL. H2. PEM 4369 - R. 4.1 mm OD, 97 mm TL. H3. PEM 6673 - L. 8.8 mm OD, 315 mm TL. Scale bars 1 mm (—).





Plate 104. POMACANTHIDAE 339 ctd. A. *Pomacanthus rhomboides* SSF 204.12. A1. PEM 4884 - L. 2.15 mm OD, 25 mm TL. A2. PEM 8636 - R. 4.0 mm OD, 66 mm TL. A3. PEM 6780 (RUSI 28452) - L. 5.7 mm OD, 110 mm TL. A4. PEM 8185 - R. 12.0 mm OD, 340 mm TL. B. *P. semicirculatus* SSF 204.11. B1. 6608 (RUSI 32186) - L. 5.4 mm OD, 109 mm TL. B2. PEM 9595 - R. 10.1 mm OD, 240 mm TL. B3. PEM 5906 - R. 11.2 mm OD, 384 mm TL. C. *Pygoplites diacanthus* SSF 204.13. C1. 0975H - L. 5.54 mm OD, 87 mm SL. PENTACEROTIDAE 341. D. *Histiopertus typus* SSF 203.1. D1. PEM 0125 - L. 2.55 mm OD, 65 mm TL. OPLEGNATHIDAE 343. E. *Oplegnathus conwayi* SSF 206.1. E1. PEM 5485 - L. 3.4 mm OD, 110 mm TL. E2. PEM 5567 - R. 10.75 mm OD, 628 mm TL. F. *O. robinsoni* SSF 206.3. F1. PEM 0297 - L. 5.82 mm OD, 188 mm TL. F2. PEM 8248 - L. 9.4 mm OD, 380 mm TL. Scale bars 1 mm (—).

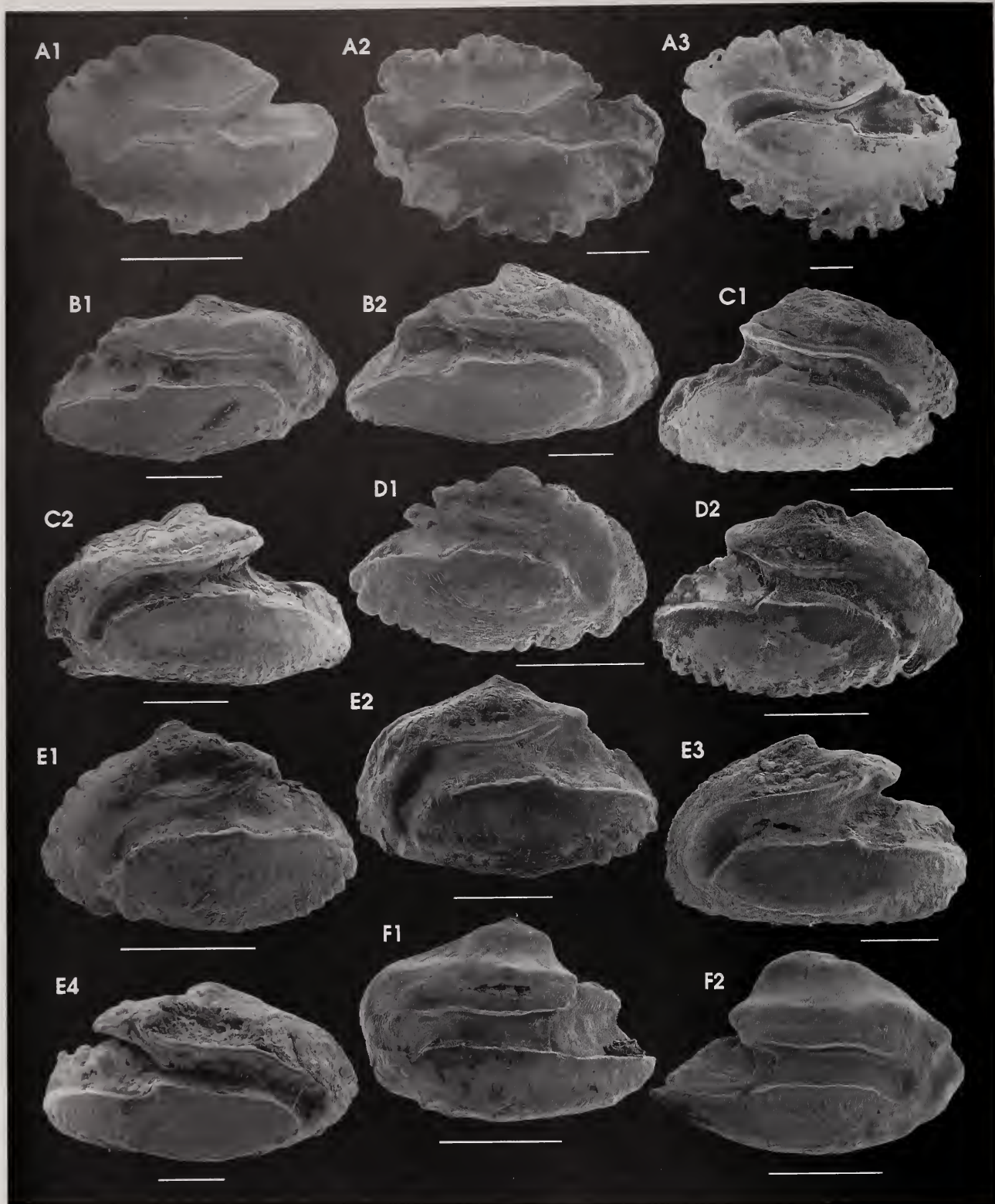


Plate 105. CICHILIDAE 344. A. *Oreochromis mossambicus* SSF 218.1. A1. PEM 1676 - L. 2.4 mm OD, 56 mm TL. A2. PEM 1669 - L. 5.22 mm OD, 145 mm TL. A3. PEM 3385 - L. 7.32 mm OD, 233 mm TL. POMACENTRIDAE 346. B. *Abudefduf sexfasciatus* SSF 219.13. B1. PEM 0364 - R. 4.0 mm OD, 120 mm TL. B2. PEM 5917 - R. 5.0 mm OD, c.145 mm TL. C. *A. sordidus* SSF 219.5. C1. PEM 0445 - R. 3.0 mm OD, 100 mm TL. C2. PEM 6594 - L. 3.7 mm OD, 155 mm TL. D. *A. sparoides* SSF 219.6. D1. PEM 2841 - R. 2.4 mm OD, 58 mm TL. D2. PEM 2840 - R. 3.05 mm OD, 85 mm TL. E. *A. vaigiensis* SSF 219.7. E1. PEM 2839 - L. 2.3 mm OD, c.72 mm TL. E2. PEM 4353 - L. 3.2 mm OD, 111 mm TL. E3. PEM 8790 (RUSI 37516) - L. 4.0 mm OD, 142 mm TL. E4. PEM 5914 - R. 5.0 mm OD, c.170 mm TL. F. *A. akallopisos* SSF 219.8. F1. PEM 11312 - L. 2.6 mm OD, 60 mm TL. F2. PEM 8873 - R. 3.0 mm OD, 72 mm TL. Scale bars 1 mm (—).



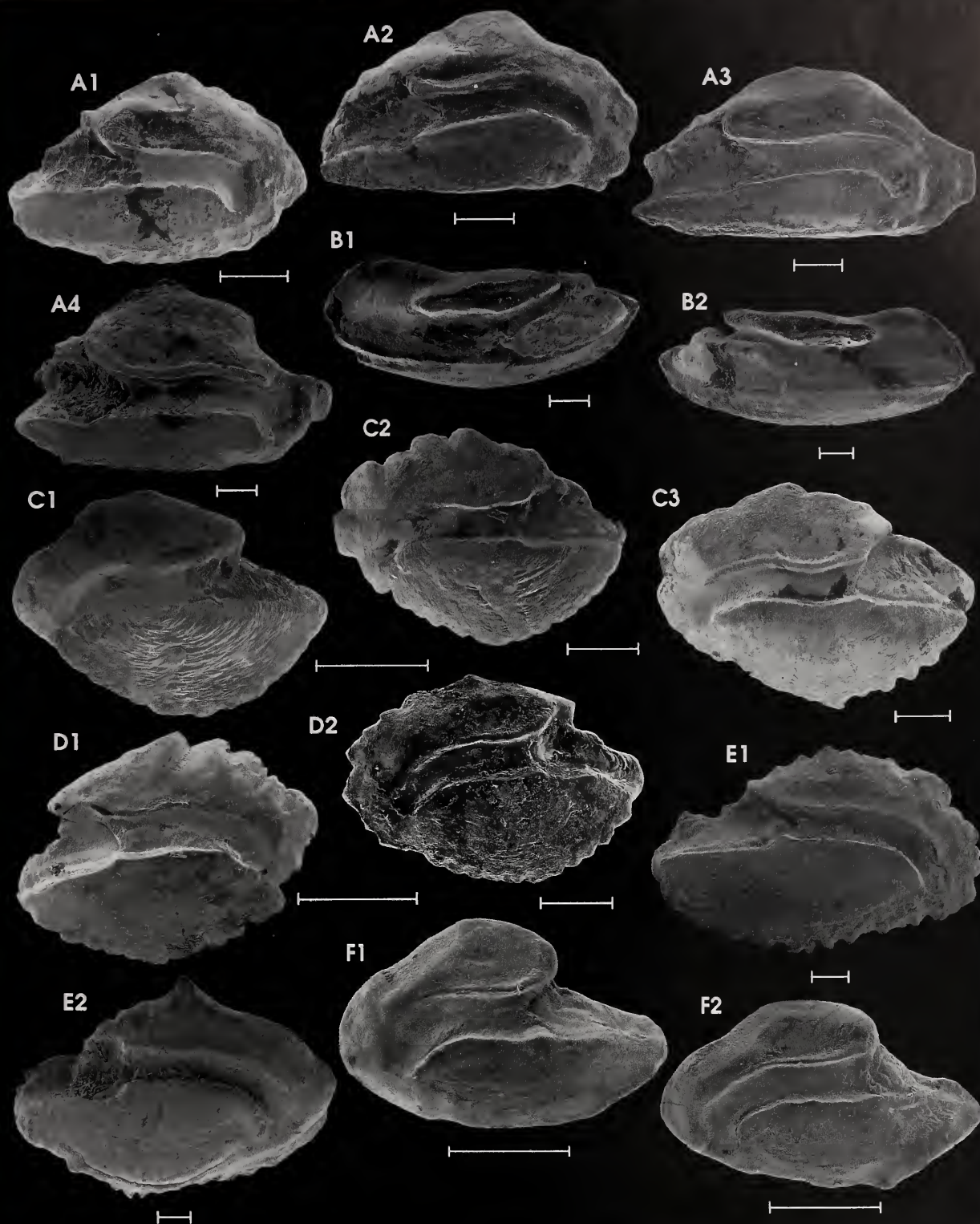


Plate 106. POMACENTRIDAE 346 ctd. A. *Amphiprion allardi* SSF 219.9. A1. PEM 4388 - R. 2.3 mm OD, 63 mm TL. A2. PEM 6758 (RUSI 28453) - R. 2.9 mm OD, 85 mm TL. A3. PEM 6130 (RUSI 17187) - R. 3.7 mm OD, 121 mm TL. A4. PEM 8633 - R. 4.3 mm OD, 128 mm TL. B. *Chromis dasygenys* SSF 219.3. B1. PEM 3902 - L. 4.1 mm OD, 102 mm TL. B2. PEM 4339 - R. 4.85 mm OD, 122 mm TL. C. *C. dimidiata* SSF 219.14. C1. PEM 8446 - L. 1.6 mm OD, 30 mm TL. C2. PEM 8424 - L. 2.2 mm OD, 48 mm TL. C3. PEM 8423 (RUSI 28499) - L. 3.1 mm OD, 60 mm TL. D. *C. nigrura* SSF 219.16. D1. PEM 2771 - R. 1.5 mm OD, 39 mm TL. D2. PEM 2856 - L. 2.1 mm OD, 51 mm TL. E. *C. opercularis* SSF 219.17. E1. PEM 14793 (RUSI 31385) - R. 5.0 mm OD, 130 mm TL. E2. PEM 14792 (RUSI 31416) - R. 5.6 mm OD, 156 mm TL. F. *C. viridis* SSF 219.12. F1. 1038H - L. 1.45 mm OD, 44 mm TL. F2. 1037H - L. c.1.5 mm OD, 46 mm TL. Scale bars 0.5 mm (—|—).



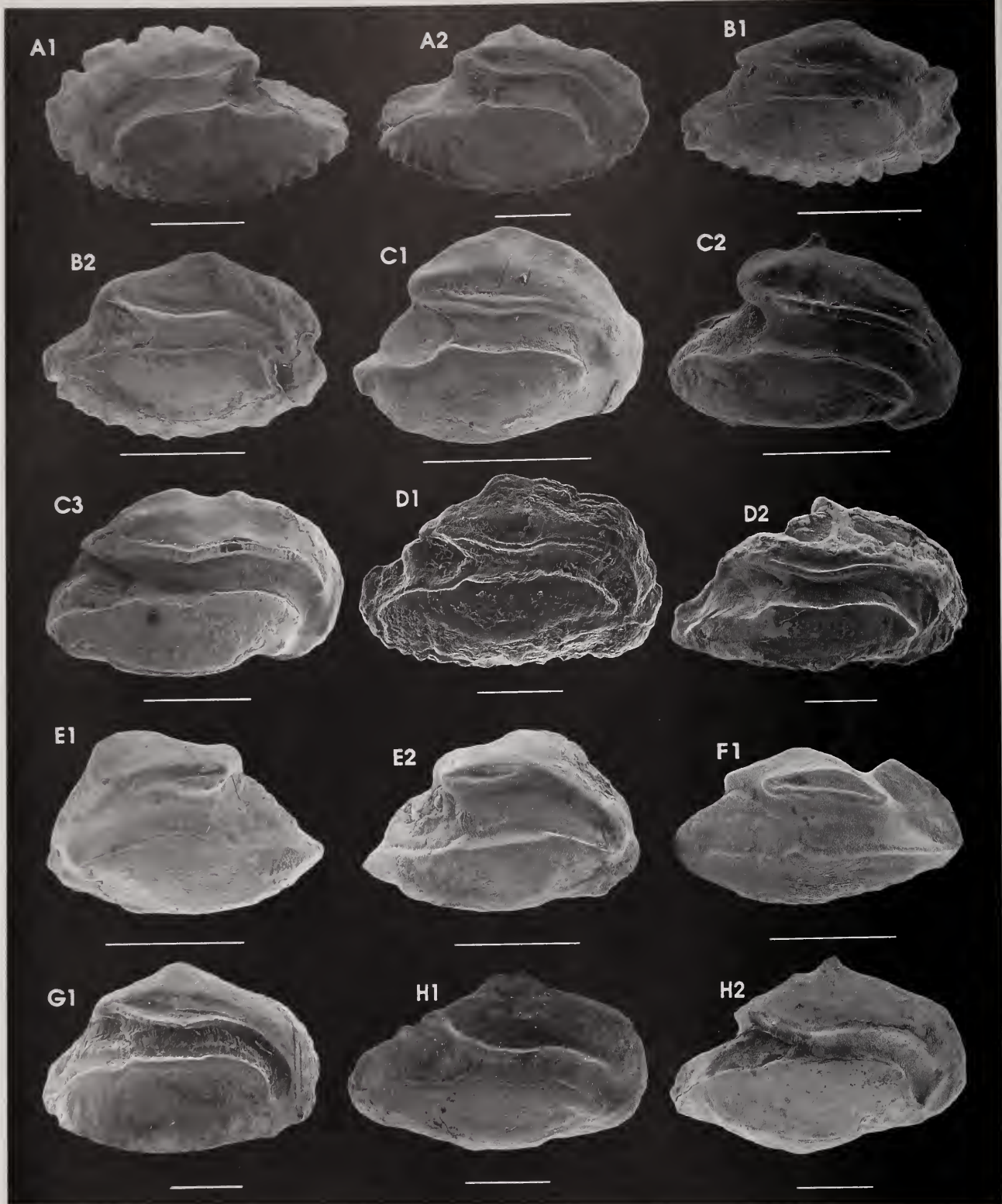


Plate 107. POMACENTRIDAE 346 ctd. A. *Chromis weberi* SSF 219.19. A1. PEM 2901 - L. 3.3 mm OD, 93 mm TL. A2. PEM 2801 - R. 3.75 mm OD 104 mm TL. B. *Chrysiptera leucopoma* SSF 219.23. B1. PEM 2847 - R. 2.3 mm OD, 61 mm TL. B2. PEM 2716 - R. 2.3 mm OD, 58 mm TL. C. *Dascyllus carneus* SSF 219.26. C1. 0996H - R. 1.7 mm OD, 44 mm TL. C2. PEM 14242 (RUSI 30632) - R. 2.6 mm OD, 80 mm TL. C3. PEM 15789 - R. 2.85 mm OD, 84 mm TL. D. *D. trimaculatus* SSF 219.27. D1. PEM 8791 (RUSI 37435) - R. 3.8 mm OD, 100 mm TL. D2. PEM 2811 - R. 4.5 mm OD, 141 mm TL. E. *Lepidozygus tapeinosoma* SSF 219.28. E1. PEM 14234 (RUSI 30635) - L. 2.3 mm OD, 73 mm TL. E2. PEM 14236 (RUSI 30635) - R. 2.5 mm OD, 79 mm TL. F. *Neopomacentrus cyanomos* SSF 219.29. F1. 1746H - R. 2.5 mm OD. G. *Plectroglyphidodon dickii* SSF 219.33. G1. PEM 14245 - R. 2.5 mm OD, 60 mm TL. H. *P. lacrymatus* SSF 219.36. H1. 1014H - R. 3.6 mm OD, 83 mm TL. H2. PEM 14266 (RUSI 31144) - R. 4.3 mm OD, 87 mm TL. Scale bars 1 mm (—).



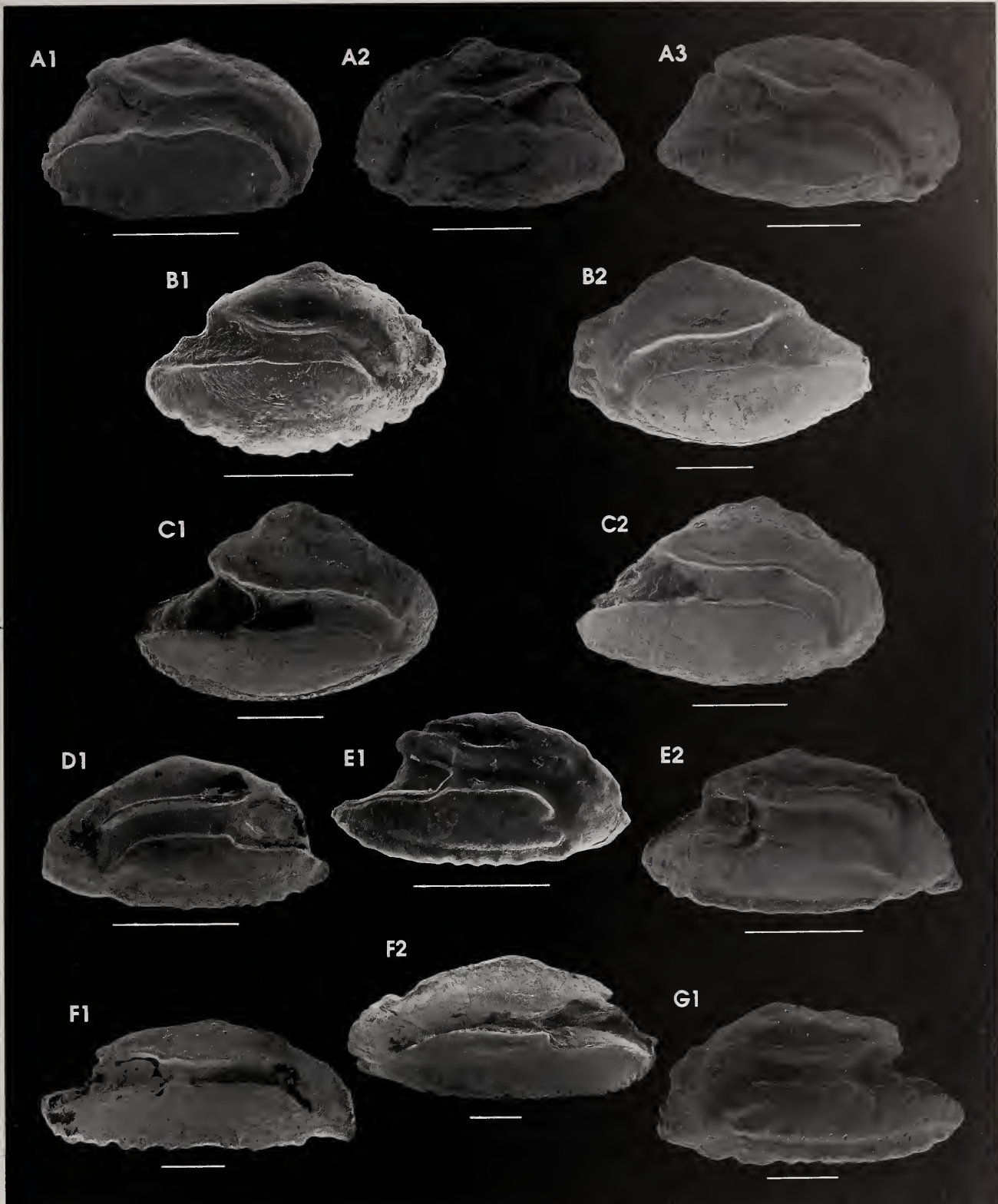
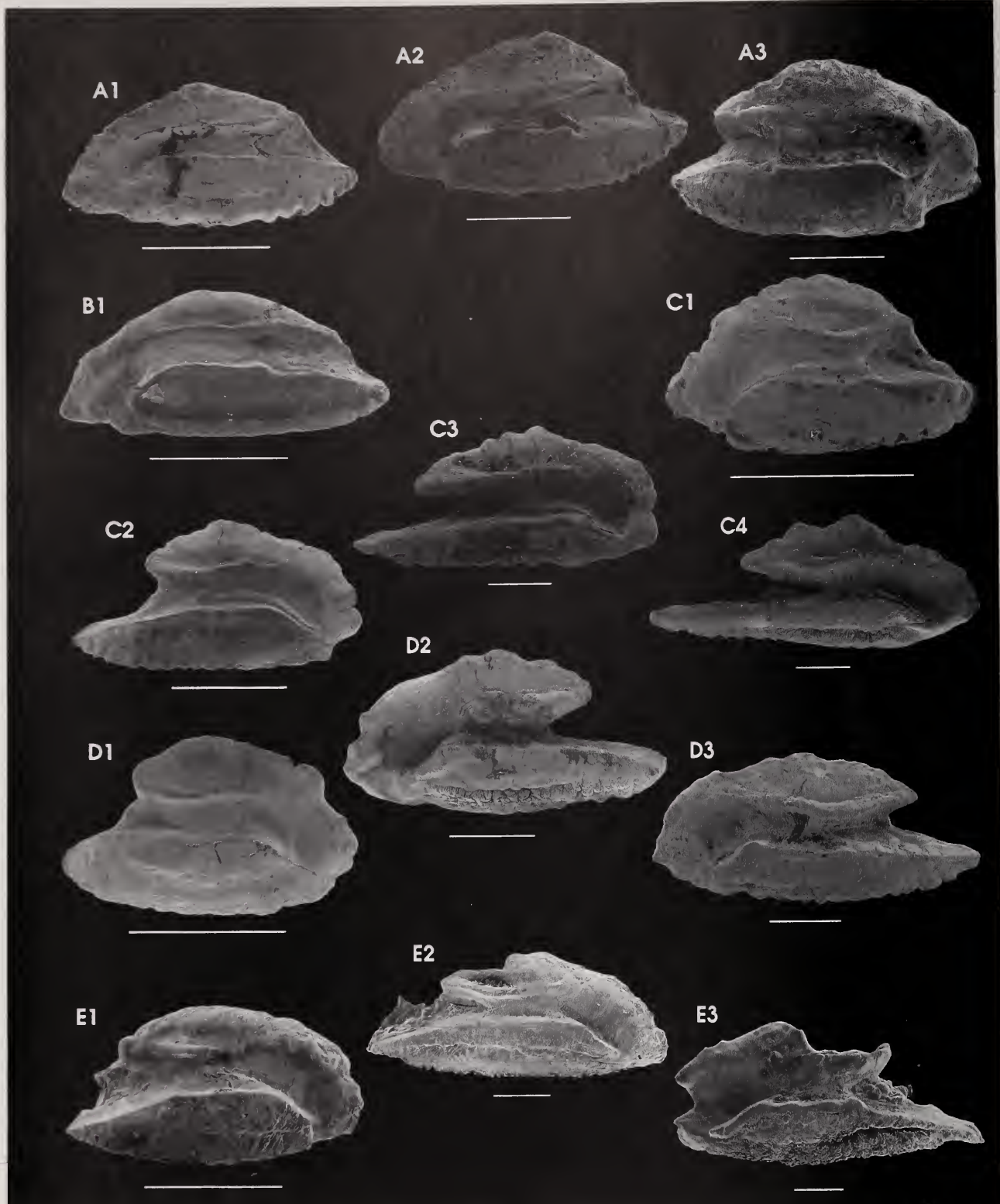


Plate 108. POMACENTRIDAE 346 ctd. A. *Plectrogyphidodon leucozonus* SSF 219.37. A1. PEM 2679 - R. 2.55 mm OD, 115 mm TL. A2. PEM 6766 (RUSI 28454) - L. 3.1 mm OD, 93 mm TL. A3. PEM 0878 - R. 3.5 mm OD, c.120 mm TL. B. *Pomacentrus trichourus* SSF 219.41. B1. PEM 8422 (RUSI 28500) - R. 2.6 mm OD, 47 mm TL. B2. PEM 15783 - L. 4.05 mm OD, 82 mm TL. C. *P. trilineatus* SSF 219.42. C1. 1204H - R. 3.9 mm OD, 101 mm TL. C2. 1205H - R. 3.45 mm OD, 78 mm TL. CIRRHITIDAE 348. D. *Amblycirrhitus bimacula* SSF 214.1. D1. PEM 2855 - L. 2.3 mm OD, 63 mm TL. E. *Cirrhitichthys oxycephalus* SSF 214.2. E1. PEM 14244 (RUSI 30610) - R. 2.3 mm OD, 58 mm TL. E2. PEM 2912 - R. 2.85 mm OD, 78 mm TL. F. *Cirrhitus pinnulatus* SSF 214.3. F1. 0635H - R. 5.15 mm OD, 207 mm TL. F2. PEM 2732 - L. 6.08 mm OD, 223 mm TL. G. *Cyprinocirrhites polyactis* SSF 214.5. G1. PEM 7720 (RUSI 20111) - L. 4.4 mm OD, 174 mm TL. Scale bars 1 mm (—).



**Plate 109. CIRRIHITIDAE 348 ctd. A. *Paracirrhites arcatus* SSF 214.6. A1. PEM 2911 - L. 2.35 mm OD, 58 mm TL. A2. PEM 14243 - L. 3.2 mm OD, 80 mm TL. A3. PEM 2908 - R. 3.44 mm OD, 93 mm TL. B. *P. forsteri* SSF 214.7. B1. 0801H - L. 2.4 mm OD, 65 mm TL. CHEILODACTYLIDAE 351. C. *Cheilodactylus fasciatus* SSF 215.1. C1. PEM 2306 - L. 1.79 mm OD, 74 mm TL. C2. PEM 10380 - R. 2.8 mm OD, 104 mm TL. C3. PEM 1138 (RUSI 8563) - R. 5.9 mm OD, 254 mm TL. C4. PEM 11343 - R. 6.5 mm OD, 275 mm TL. D. *C. pixi* SSF 215.2. D1. PEM 5587 - R. 2.0 mm OD, 82 mm TL. D2. PEM 5340 (RUSI 13870) - L. 4.0 mm OD, 164 mm TL. D3. PEM 4526 - L. 4.75 mm OD, 186 mm TL. E. *Chirodactylus brachydactylus* SSF 215.3. E1. PEM 2613 (RUSI 11442) - R. 2.05 mm OD, 87 mm TL. E2. PEM 2941 - R. 5.4 mm OD, 301 mm TL. E3. PEM 0052 - L. 6.55 mm OD, 381 mm TL. Scale bars 1 mm (—).**





Plate 110. CHEILODACTYLIDAE 351 ctd. A. *Chirodactylus grandis* SSF 215.4. A1. PEM 7193 - L. 1.5 mm OD, 60 mm TL. A2. PEM 11632 - L. 3.6 mm OD, 163 mm TL. A3. PEM 12204 - R. 6.2 mm OD, 490 mm TL. A4. PEM 10264 - R. 9.1 mm OD, 870 mm TL. B. *C. jessicalenorum* SSF 215.5. B1. PEM 9632 - R. 6.8 mm OD, 440 mm TL. B2. PEM 12460 - L. 9.4 mm OD, 795 mm TL. CEPOLIDAE 354. C. *Owstonia cf. weberi?* SSF 226.-. C1. PEM 5090 (RUSI 14018) - L. 5.48 mm OD, 90 mm SL. C2. PEM 5089 (RUSI 14018) - R. 5.68 mm OD, 100 mm SL. C3. PEM 5091 (RUSI 14018) - L. 9.9 mm OD, 260 mm SL. MUGILIDAE 355. D. *Crenimugil crenilabris* SSF 222.1. D1. 1179H - R. 6.5 mm OD, 242 mm TL. E. *Liza alata* SSF 222.2. E1. 0468H - L. 7.9 mm OD, 270 mm TL. F. *L. dumerilii* SSF 222.3. F1. PEM 1049 - R. 4.1 mm OD, 87 mm SL. F2. PEM 1047 - R. 5.5 mm OD, 129 mm SL. F3. PEM 1164 - L. 9.49 mm OD, 274 mm SL. Scale bars 1 mm (—).

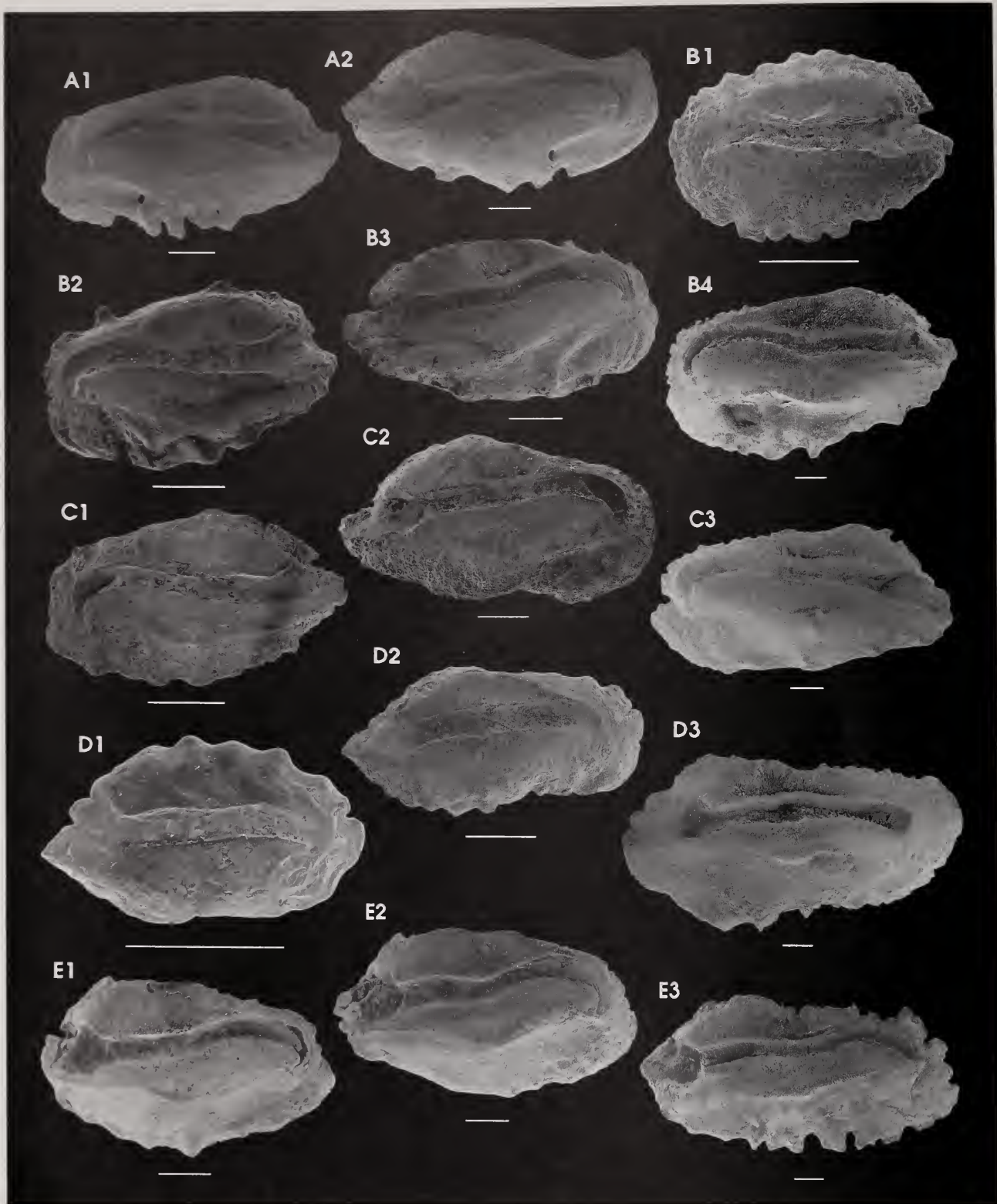


Plate 111. MUGILIDAE 355 ctd. A. *Liza macrolepis* SSF 222.5. A1. PEM 1039 - L. 7.0 mm OD, 225 mm TL. A2. PEM 1038 - R. 7.92 mm OD, 263 mm TL. B. *L. richardsonii* SSF 222.7. B1. PEM 1499 - L. 3.0 mm OD, 79 mm TL. B2. PEM 10422 - L. 4.2 mm OD, 120 mm TL. B3. PEM 10418 - R. 6.3 mm OD, 192 mm TL. B4. PEM 2434 - L. 10.5 mm OD, 371 mm TL. C. *L. tricuspidens* SSF 222.8. C1. PEM 9933 - L. 4.1 mm OD, 127 mm TL. C2. PEM 10425 - R. 6.3 mm OD, 242 mm TL. C3. PEM 1441 - L. 10.44 mm OD, 540 mm TL. D. *Mugil cephalus* SSF 222.10. D1. PEM 1503 - R. 2.1 mm OD, 55 mm TL. D2. PEM 1050 - R. 4.42 mm OD, 119 mm TL. D3. PEM 10348 - R. 13.0 mm OD, 736 mm TL. E. *Myxus capensis* SSF 222.11. E1. PEM 1154 - R. 6.4 mm OD, 225 mm TL. E2. PEM 1150 - R. 7.4 mm OD, 289 mm TL. E3. PEM 2531 - R. 12.25 mm OD, 482 mm TL. Scale bars 1 mm (—).



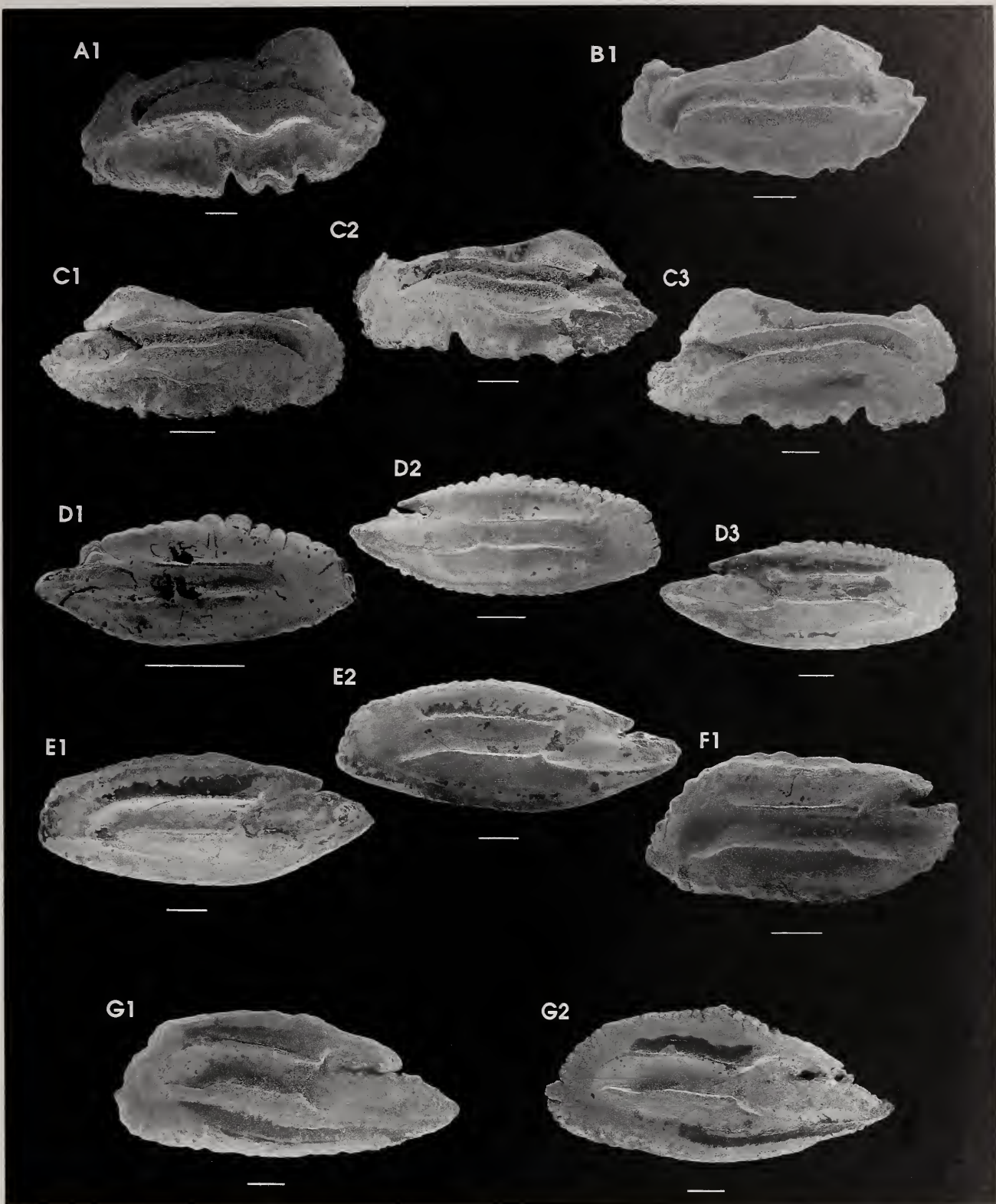


Plate 112. MUGILIDAE 355 ctd. A. *Valamugil buchanani* SSF 222.12. A1. PEM 2825 - L. 11.12 mm OD, 566 mm TL. B. *V. robustus* SSF 222.14. B1. PEM 8239 (RUSI 37467) - L. 7.88 mm OD, 255 mm TL. C. *V. seheli* SSF 222.15. C1. 1167H - R. 7.0 mm OD, 225 mm TL. C2. 1166H - L. 8.04 mm OD, 264 mm TL. C3. 1055H - R. 9.46 mm OD, 364 mm TL. SPHYRAENIDAE 356. D. *Sphyraena acutipinnis* SSF 224.1. D1. PEM 7233 (RUSI 28456) - R. 3.5 mm OD, 91 mm TL. D2. PEM 3594 - R. 6.74 mm OD, 207 mm TL. D3. PEM 6700 (RUSI 28456) - R. 8.2 mm OD, 270 mm TL. E. *S. chrysotaenia* SSF 224.4. E1. PEM 12448 - L. 7.7 mm OD, 262 mm TL. E2. PEM 12449 - L. 9.0 mm OD, 260 mm TL. F. *S. flavicauda* SSF 224.5. F1. PEM 14550 (RUSI 31426) - L. 6.7 mm OD, 295 mm TL. G. *S. forsteri* SSF 224.6. G1. PEM 15773 - L. 10.0 mm OD, 442 mm TL. G2. PEM 15774 - L. 9.26 mm OD, 420 mm TL. Scale bars 1 mm (—).

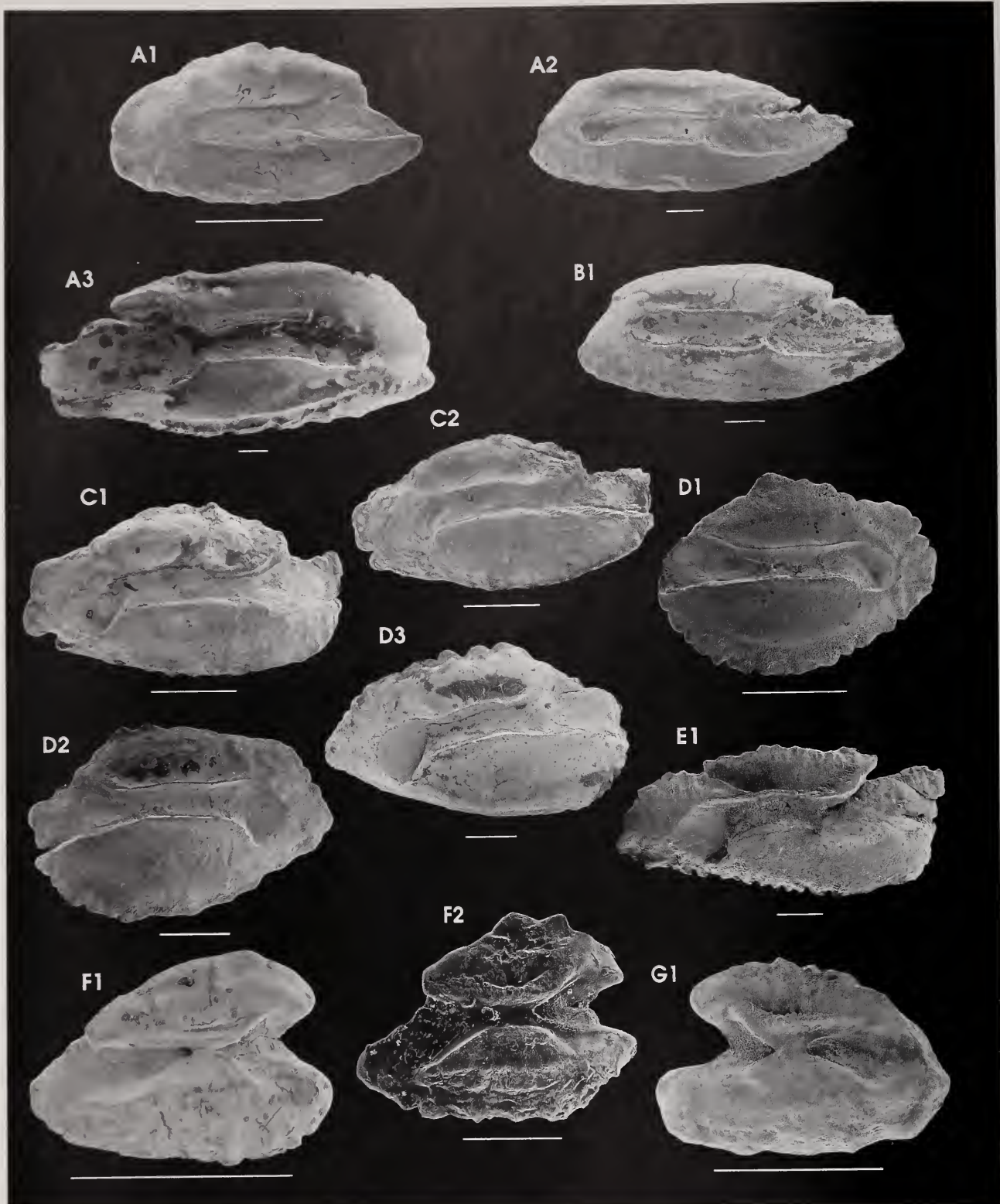


Plate 113. SPIHYRAENIDAE 356 ctd. A. *Sphyraena jello* SSF 224.7. A1. PEM 0081 - L. 2.5 mm OD, c.70 mm TL. A2. PEM 0402 - L. 9.36 mm OD, 370 mm TL. A3. PEM 8142 - R. 15.3 mm OD, 1900 mm TL. B. *S. putnamiae* SSF 224.9. B1. PEM 6652 - L. 8.7 mm OD, 253 mm TL. POLYNEMIDAE 357. C. *Polydactylus plebeius* SSF 223.2. C1. 1377H - L. 3.9 mm OD, 167 mm TL. C2. 1378H - L. 4.0 mm OD, 180 mm TL. D. *P. sextarius* SSF 223.3. D1. PEM 15281 (RUSI 36871) - R. 2.75 mm OD, 74 mm TL. D2. PEM 15279 (RUSI 36871) - R. 4.65 mm OD, 140 mm TL. D3. PEM 6618 (RUSI 28494) - L. 6.3 mm OD, 201 mm TL. E. *Polydactylus* sp. SSF 223.-. E1. PEM 14531 - L. 7.8 mm OD, 357 mm TL. LABRIDAE 358. F. *Anampses caeruleopunctatus* SSF 220.1. F1. PEM 2909 - L. 1.4 mm OD, 76 mm TL. F2. PEM 6437 - L. 2.6 mm OD, 198 mm TL. G. *A. lineatus* SSF 220.2. G1. PEM 14800 (RUSI 31369) - R. 1.5 mm OD, 77 mm TL. Scale bars 1 mm (—).





Plate 114. LABRIDAE 358 ctd. A. *Anampses meleagrides* SSF 220.3. A1. PEM 14801 (RUSI 31367) - R. 1.6 mm OD, 84 mm TL. A2. PEM 14802 (RUSI 31375) - L. 2.2 mm OD, 131 mm TL. A3. PEM 14803 (RUSI 31374) - R. 2.4 mm OD, 135 mm TL. B. *Anchichoerops natalensis* SSF 220.4. B1. PEM 2168 - L. 6.68 mm OD, 575 mm TL. B2. PEM 8697 - L. 8.3 mm OD 557 mm TL. C. *Bodianus anthioides* SSF 220.5. C1. PEM 8830 (RUSI 37439) - L. 3.1 mm OD, 114 mm TL. D. *B. bilunulatus* SSF 220.7. D1. PEM 0029 - L. 5.22 mm OD. D2. PEM 8542 (RUSI 37482) - R. 5.9 mm OD, 248 mm TL. D3. PEM 8535 (RUSI 34154) - R. 6.3 mm OD, 255 mm TL. E. *B. diana* SSF 220.8. E1. PEM 4403 - R. 3.8 mm OD, 157 mm TL. E2. PEM 8792 (RUSI 37427) - L. 4.7 mm OD, 185 mm TL. F. *B. perditio* SSF 220.10. F1. PEM 9609 - R. 8.1 mm OD, 483 mm TL. F2. PEM 9624 - L. 8.6 mm OD, 490 mm TL. G. *Cheilinus digrammus* SSF 220.13. G1. PEM 15696 (RUSI 42676) - R. 5.0 mm OD, 234 mm TL. G2. 1033H - L. 5.18 mm OD, 239 mm TL. Scale bars 1 mm (—).



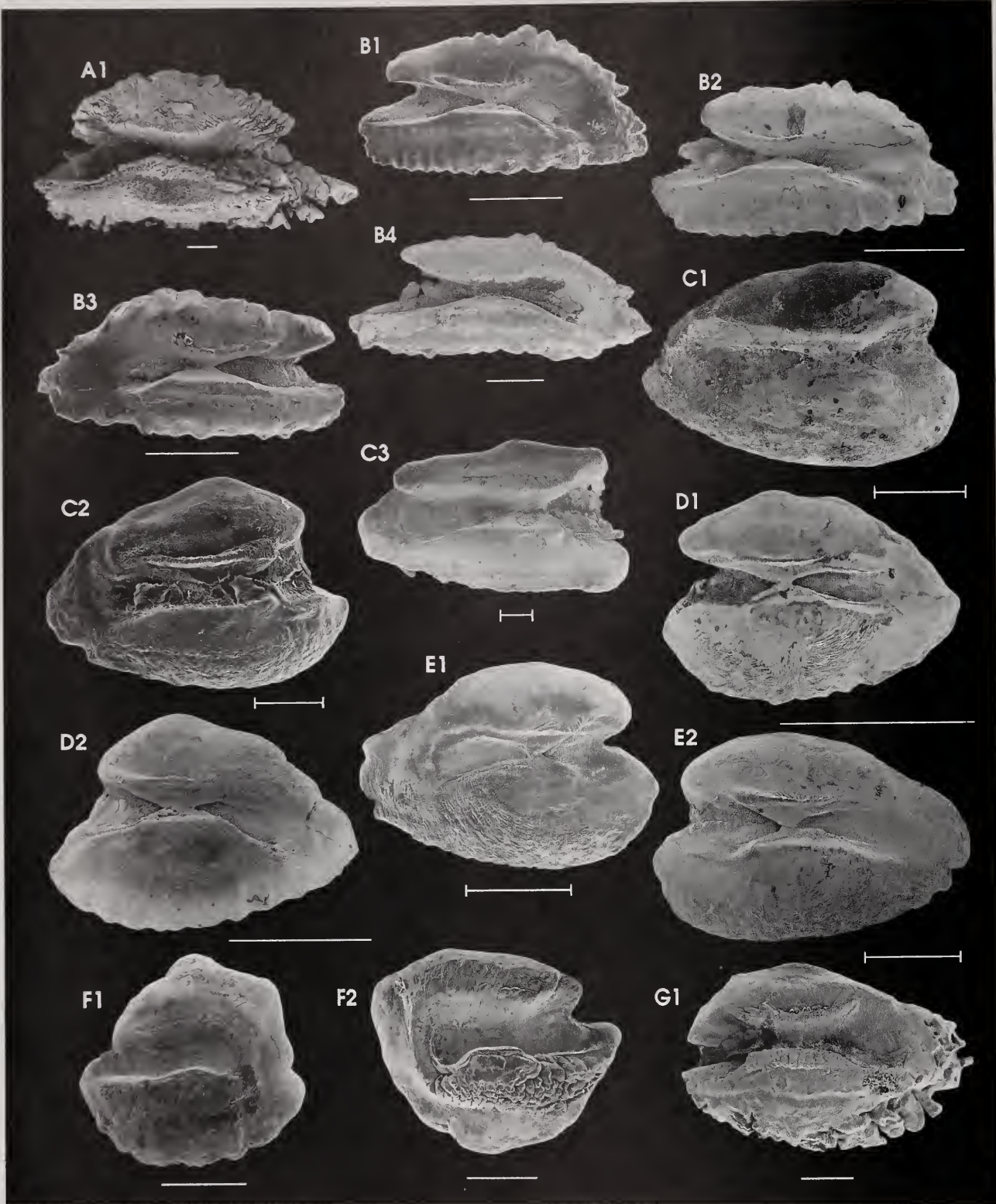


Plate 115. LABRIDAE 358 ctd. A. *Cheilinus undulatus* SSF 220.16. A1. PEM 8499 - R. 12.1 mm OD, 1370 mm TL. B. *Cheilio inermis* SSF 220.17. B1. PEM 15421 (RUSI 40581) - R. 3.1 mm OD, 195 mm TL. B2. 1220H - R. 3.15 mm OD, 250 mm TL. B3. PEM 15420 (RUSI 40581) - L. 3.4 mm OD, 220 mm TL. B4. 1047H - R. 5.64 mm OD, 430 mm TL. C. *Coris aygula* SSF 220.20. C1. PEM 0048 - L. 1.8 mm OD. C2. PEM 8665 (RUSI 37452) - L. 2.2 mm OD, 113 mm TL. C3. PEM 15566 (RUSI 42762) - L. 4.35 mm OD, 395 mm TL. D. *C. caudimacula* SSF 220.21. D1. PEM 2910 - R. 1.6 mm OD, 73 mm TL. D2. PEM 14798 (RUSI 31386) - R. 2.3 mm OD, 131 mm TL. E. *C. gainard africana* SSF 220.23. E1. 0400H - L. 1.5 mm OD, 66 mm TL. E2. 0401H - R. 1.51 mm OD, 82 mm TL. F. *Cymolutes praetextatus* SSF 220.24. F1. PEM 15417 (RUSI 40580) - R. 2.75 mm OD, 137 mm TL. F2. PEM 15419 (RUSI 40580) - L. 3.65 mm OD, 160 mm TL. G. *Epibulus insidiator* SSF 220.26. G1. PEM 15386 (RUSI 40606) - R. 6.0 mm OD, 270 mm TL. Scale bars 1 mm (—) or 0.5 mm (|—|).



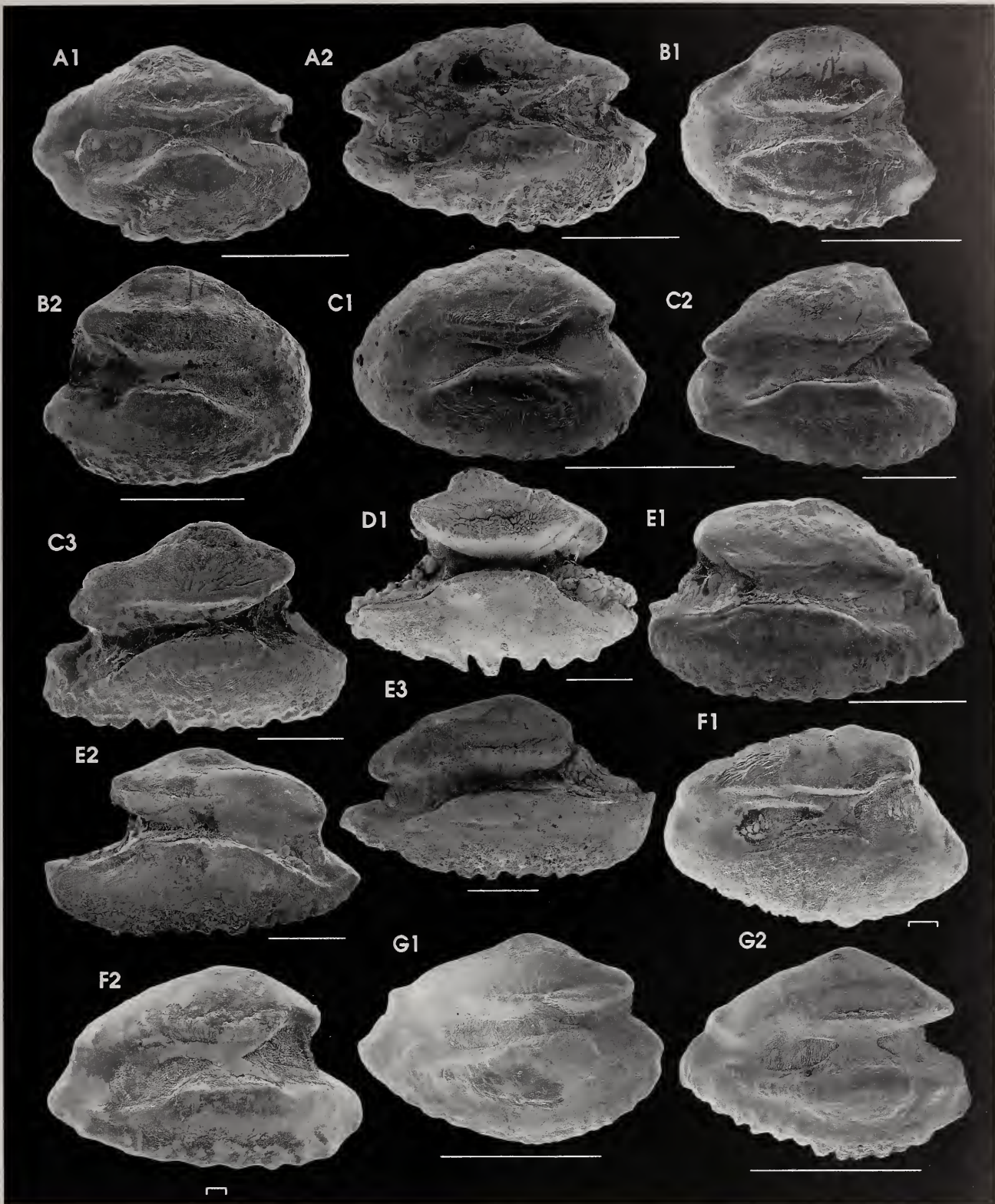


Plate 116. LABRIDAE 358 ctd. A. *Gomphosus caeruleus* SSF 220.27. A1. 1215H - L. 2.35 mm OD, 126 mm TL. A2. PEM 0449 - L. 3.0 mm OD, 155 mm TL. B. *Halichoeres cosmetus* SSF 220.28. B1. PEM 14233 (RUSI 30626) - L. 2.0 mm OD, 89 mm TL. B2. PEM 15451 (RUSI 40557) - R. 2.25 mm OD, 114 mm TL. C. *H. hortulanus* SSF 220.30. C1. PEM 14804 (RUSI 31370) - L. 1.9 mm OD, 81 mm TL. C2. PEM 14797 (RUSI 31389) - L. 3.1 mm OD, 172 mm TL. C3. PEM 8784 - L. 3.4 mm OD, 217 mm TL. D. *Hemigymnus fasciatus* SSF 220.36. D1. 1053H - R. 4.75 mm OD, 370 mm TL. E. *Hologymnosus doliatus* SSF 220.38. E1. PEM 6436 - R. 3.0 mm OD, 203 mm TL. E2. PEM 5963 - R. 4.3 mm OD, 329 mm TL. E3. PEM 14533 - L. 4.8 mm OD, 350 mm TL. F. *Labroides dinidiatus* SSF 220.41. F1. PEM 8447 (RUSI 28498) - L. 1.3 mm OD, 46 mm TL. F2. PEM 2808 - L. 1.65 mm OD, 77 mm TL. G. *Pseudocheilinus hexataenia* SSF 220.48. G1. PEM 15786 - L. 1.95 mm OD, 58 mm TL. G2. PEM 14224 (RUSI 30587) - L. 2.9 mm OD, 63 mm TL. Scale bars 1 mm (—) or 0.1 mm (—).



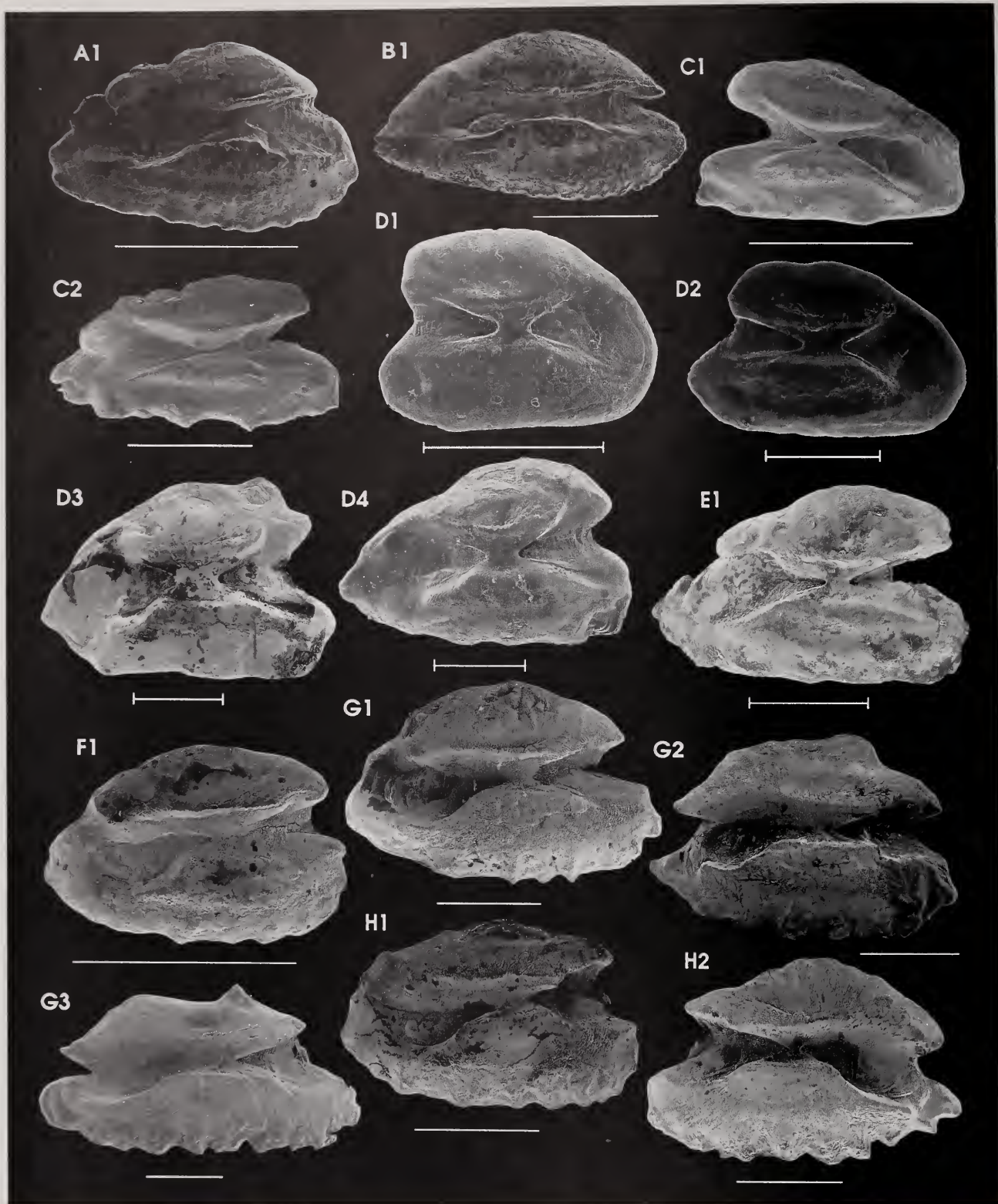


Plate 117. LABRIDAE 358 ctd. A. *Pteragogus flagellifer* SSF 220.52. A1. PEM 15454 (RUSI 40571) - L. 1.7 mm OD, 72 mm TL. B. *P. pelycus* SSF 220.53. B1. PEM 15455 (RUSI 40572) - L. 2.45 mm OD, 98 mm TL. C. *Stethojulis albobittata* SSF 220.55. C1. PEM 15428 (RUSI 40583) - R. 1.7 mm OD, 102 mm TL. C2. PEM 15426 (RUSI 40583) - L. 2.5 mm OD, 113 mm TL. D. *S. interrupta* SSF 220.56. D1. PEM 10342 - R. 0.9 mm OD, 39 mm TL. D2. PEM 10453 - R. 1.3 mm OD, 70 mm TL. D3. PEM 10451 - L. 1.7 mm OD, 97 mm TL. D4. PEM 10338 - L. 1.8 mm OD, 98 mm TL. E. *S. strigiventer* SSF 220.57. E1. PEM 4406 - L. 1.95 mm OD, 70 mm TL. F. *Thalassoma amblycephalum* SSF 220.58. F1. PEM 14246 (RUSI 30615) - L. 1.5 mm OD, 62 mm TL. G. *T. hebraicum* SSF 220.61. G1. PEM 5992 - L. 3.1 mm OD, 147 mm FL. G2. PEM 8156 (RUSI 34142) - L. 3.3 mm OD, 163 mm FL. G3. PEM 8213 (RUSI 34153) - L. 4.3 mm OD, 189 mm FL. H. *T. lunare* SSF 220.62. H1. PEM 0011 - L. 2.55 mm OD. H2. PEM 8291 (RUSI 34149) - R. 3.4 mm OD, 207 mm TL. Scale bars 1 mm (—) or 0.5 mm (|—|).



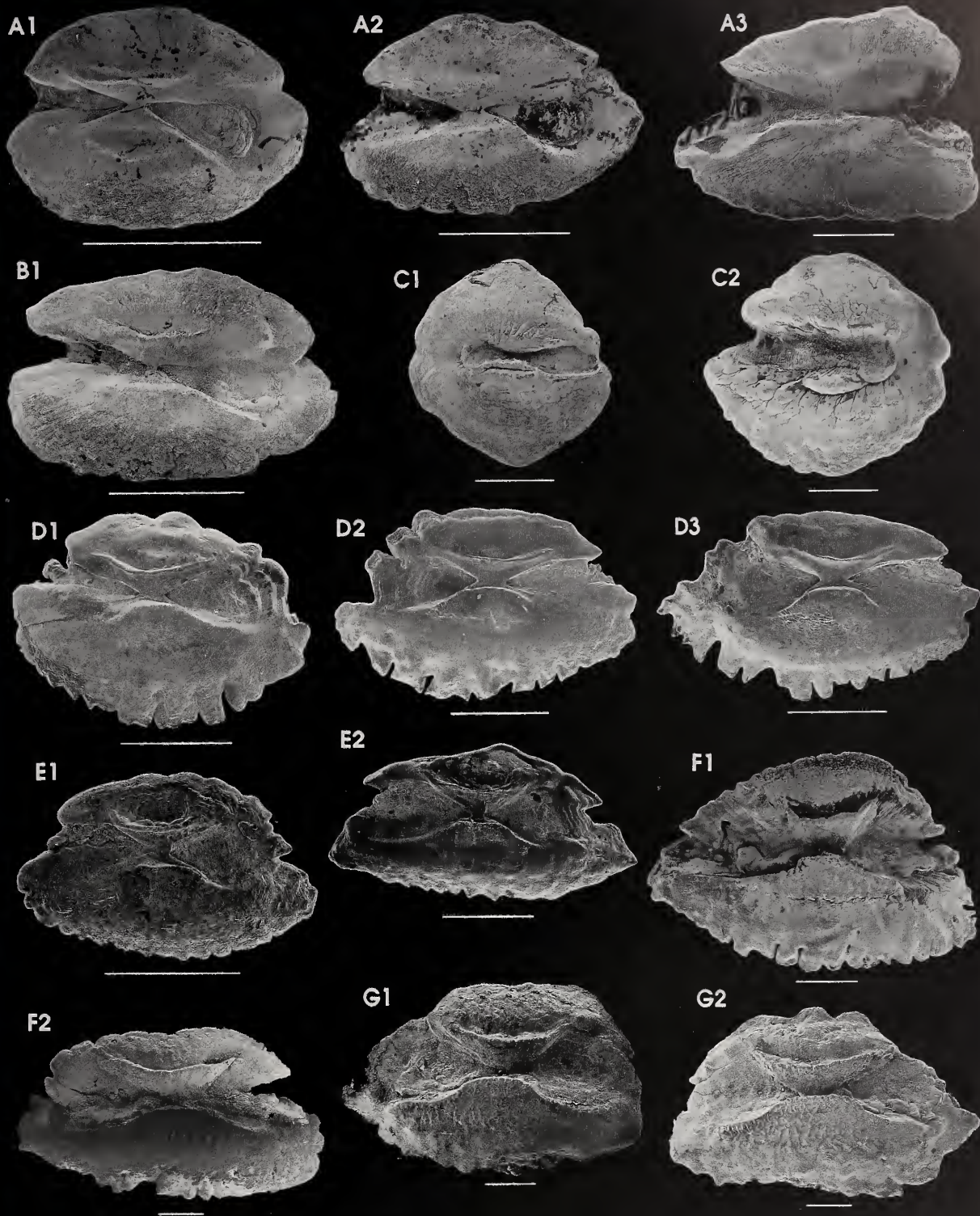


Plate 118. LABRIDAE 358 ctd. **A.** *Thalassoma purpureum* SSF 220.63. **A1.** PEM 0448 - R. 1.8 mm OD, 115 mm TL. **A2.** PEM 8668 (RUSI 37456) - R. 2.5 mm OD, 160 mm TL. **A3.** PEM 9603 - L. 3.7 mm OD, 343 mm TL. **B.** *T. trilobatum* SSF 220.65. **B1.** PEM 0446 - R. 2.6 mm OD, 165 mm TL. **C.** *Xyrichtys pavo* SSF 220.67. **C1.** PEM 6476 - L. 2.7 mm OD, 103 mm TL. **C2.** PEM 6475 - R. 3.7 mm OD, 173 mm TL. **SCARIDAE 360.** **D.** *Calotomus spinidens* SSF 221.2. **D1.** PEM 15412 (RUSI 40578) - L. 2.8 mm OD, 123 mm TL. **D2.** PEM 15436 (RUSI 40578) - R. 3.1 mm OD, 115 mm TL. **D3.** PEM 15411 (RUSI 40579) - R. 3.3 mm OD, 124 mm TL. **E.** *Leptoscarus vaigiensis* SSF 221.3. **E1.** PEM 15442 (RUSI 40560) - L. 2.85 mm OD, 109 mm TL. **E2.** PEM 15423 (RUSI 40582) - L. 3.45 mm OD, 169 mm TL. **F.** *Hipposcarus harid* SSF 221.5. **F1.** 1052H - L. 6.08 mm OD, 325 mm TL. **F2.** PEM 15383 (RUSI 40599) - L. 7.08 mm OD, 424 mm TL. **G.** *Scarus cyaneus* SSF 221.8. **G1.** PEM 15405 (RUSI 40603) - L. 6.2 mm OD, 312 mm TL. **G2.** PEM 15404 (RUSI 40603) - R. 7.0 mm OD, 364 mm TL. Scale bars 1 mm (—).



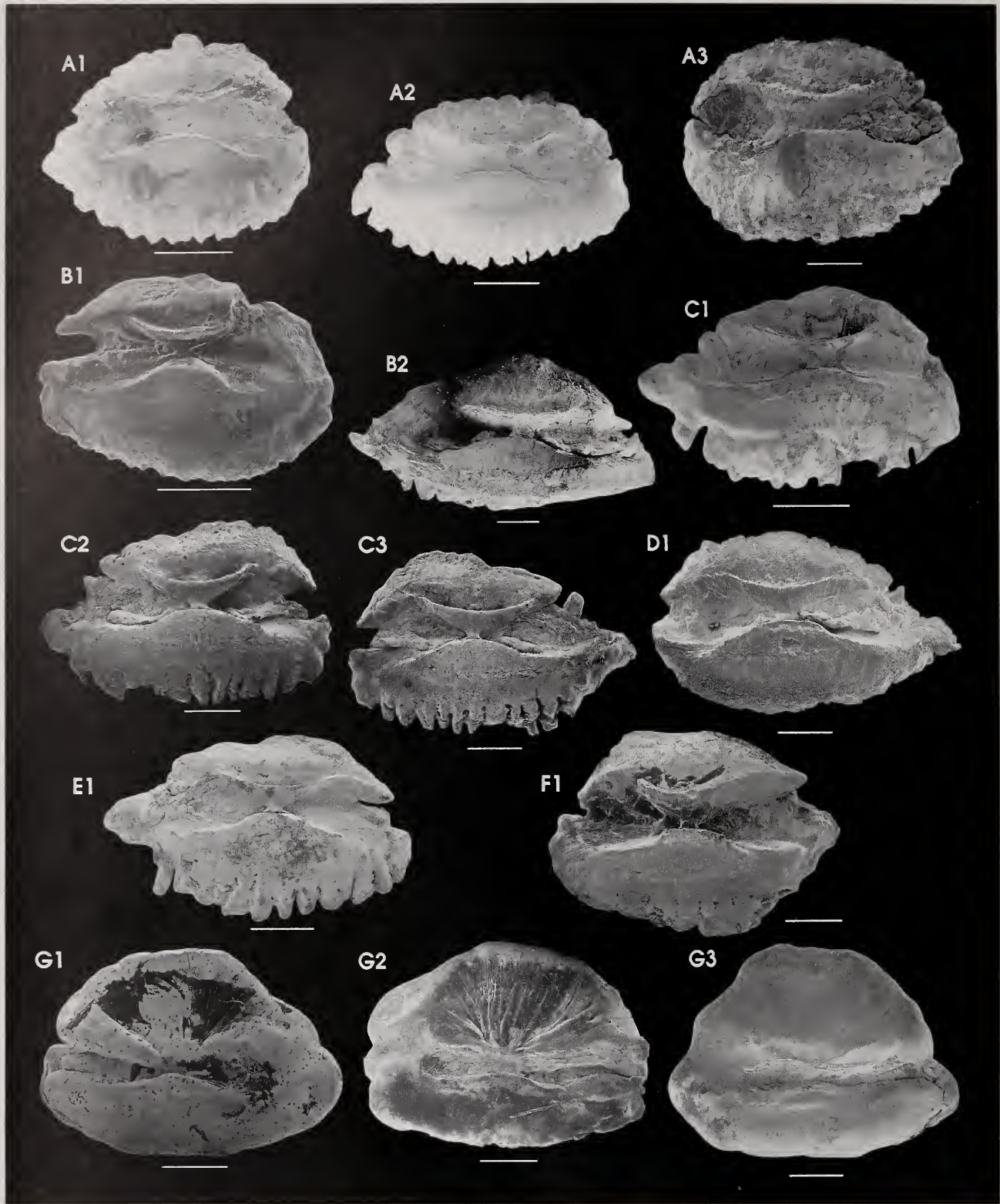


Plate 119. SCARIDAE 360 ctd. A. *Scarus ghobban* SSF 221.11. A1. PEM 15741 (RUSI 42706) - L. 3.5 mm OD, 210 mm TL. A2. PEM 15740 (RUSI 42706) - L. 4.45 mm OD, 245 mm TL. A3. PEM 5922 - R. 5.2 mm OD, c.430 mm TL. B. *S. niger* SSF 221.13. B1. 1019H - R. 3.35 mm OD, 157 mm TL. B2. PEM 15382 (RUSI 40605) - L. 7.36 mm OD, 286 mm TL. C. *S. psittacus* SSF 221.14. C1. PEM 14558 (RUSI 31450) - L. 4.6 mm OD, 190 mm TL. C2. PEM 15398 (RUSI 40590) - L. 5.68 mm OD, 255 mm TL. C3. PEM 15398 - R. D. *S. rubroviolaceus* SSF 221.15. D1. PEM 15485 (RUSI 40618) - R. 5.9 mm OD, 473 mm TL. E. *Scarus scaber* SSF 221.17. E1. PEM 14559 (RUSI 31430) - L. 5.3 mm OD, 235 mm TL. F. *S. sordidus* SSF 221.18. F1. 0985H - R. 5.64 mm OD, 275 mm TL. ZOARCIDAE 362. G. *Lycodes agulhensis* SSF 94.1. G1. PEM 13966 (SAM 31620) - R. 5.2 mm OD, 282 mm TL. G2. PEM 14512 (RUSI 31400) - L. 5.4 mm OD, 273 mm TL. G3. PEM 14459 (RUSI 31460) - L. 6.0 mm OD, 287 mm TL. Scale bars 1 mm (—).



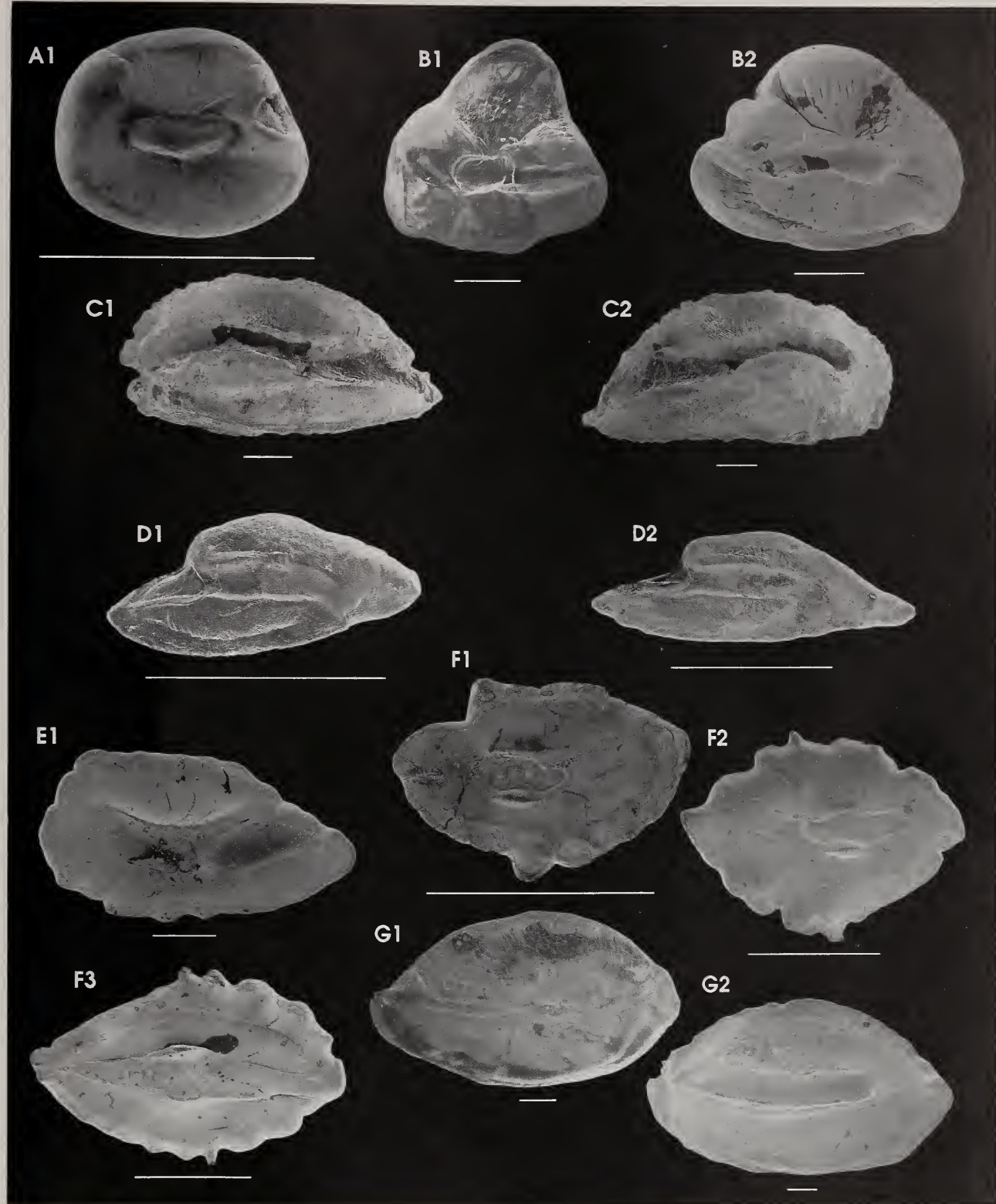


Plate 120. ZOARCIDAE 362 ctd. A. *Melanostigma gelatinosum* SSF 94.3. A1. PEM 13345 - L. 1.0 mm OD, 122 mm TL. B. *Pachycara crassiceps* SSF 94.-. B1. PEM 14613 (SAM 32191) - L. 3.6 mm OD, 376 mm TL. B2. PEM 13784 (SAM 31618) - R. 3.9 mm OD, 412 mm TL. OPISTHOGNATHIDAE 375. C. *Opisthognathus muscatensis* SSF 225.2. C1. PEM 5666 - L. 7.1 mm OD, 330 mm TL. C2. PEM 8593 - R. 8.2 mm OD, 370 mm TL. CONGROGADIDAE 376. D. *Halidesmus scapularis* SSF 227.1. D1. PEM 10386 - R. 1.6 mm OD, 93 mm TL. D2. PEM 5227 - R. 1.8 mm OD, 125 mm TL. CHIASMODONTIDAE 377. E. *Kali macrodon* SSF 228.6. E1. PEM 13612 - L. 5.2 mm OD, 170 mm TL. CHAMPSODONTIDAE 378. F. *Champsodon capensis* SSF 229.1. F1. PEM 7164 - R. 1.5 mm OD, 57 mm TL. F2. PEM 12568 (RUSI 28461) - L. 2.2 mm OD, 106 mm TL. F3. PEM 13030 - L. 2.8 mm OD, 122 mm TL. URANOSCOPIDAE 383. G. *Uranoscopus archionema* SSF 230.2. G1. PEM 12910 (RUSI 28460) - R. 8.8 mm OD, 171 mm TL. G2. PEM 12970 - R. 11.56 mm OD, 295 mm TL. Scale bars 1 mm (—).

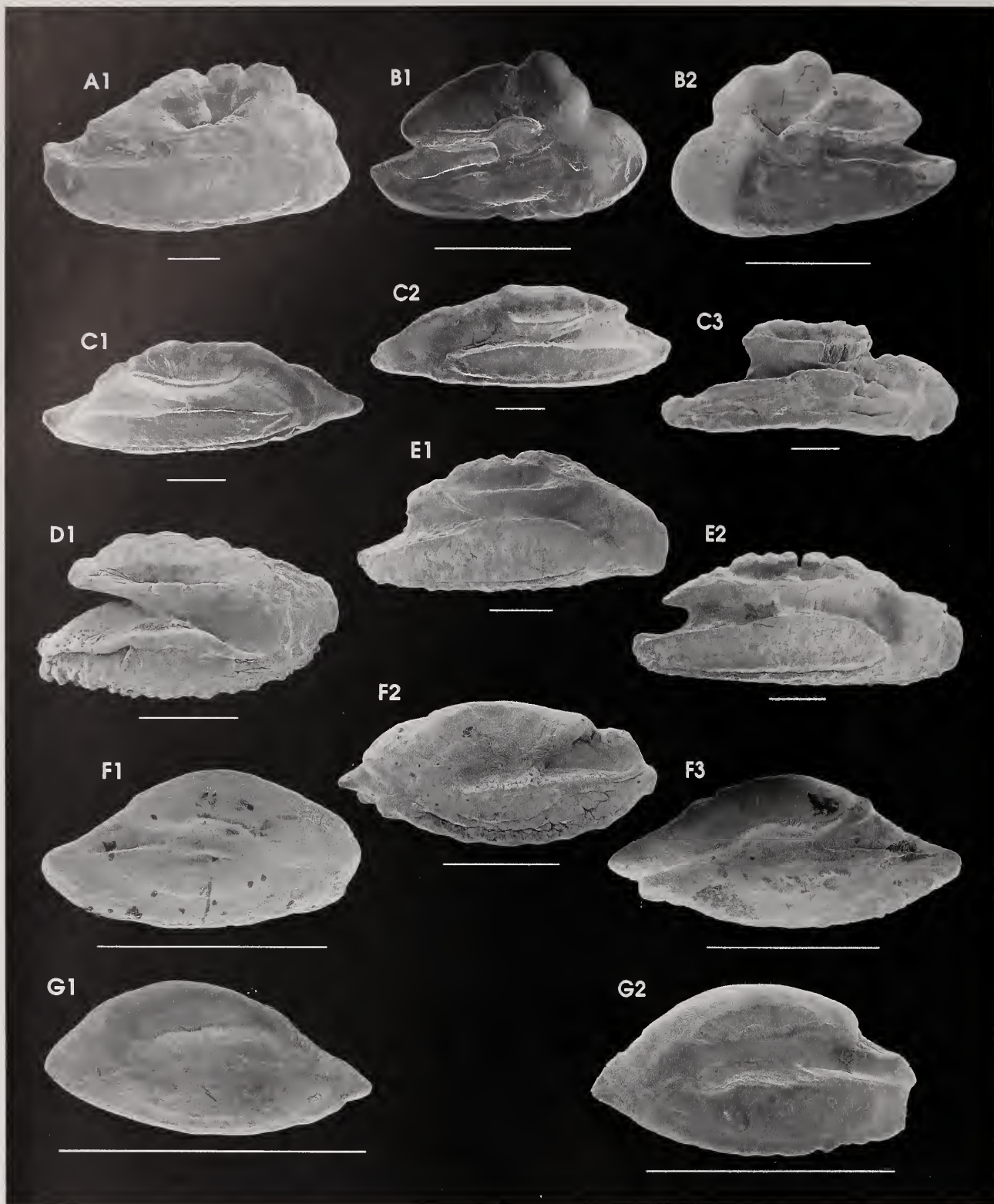


Plate 121. PERCOPIIDAE 387. A. *Bembrops platyrhynchus* SSF 233.1. A1. PEM 13050 (RUSI 28459) - R. 6.1 mm OD, 185 mm TL. B. *Bembrops* sp. SSF 233.-. B1. PEM 7772 - R. 2.2 mm OD, 114 mm TL. B2. PEM 7773 - L. 2.4 mm OD, 129 mm TL. MUGILOIDIDAE 388. C. *Parapercis maritzi* SSF 234.2. C1. PEM 14999 (RUSI 37319) - L. 5.6 mm OD, 148 mm TL. C2. PEM 15001 (SAM 32442) - L. 6.1 mm OD, 164 mm TL. C3. PEM 14994 (BPBM 34911) - R. 6.3 mm OD, 192 mm TL. D. *P. punctulata* SSF 234.4. D1. PEM 4620 - R. 3.05 mm OD, 93 mm TL. E. *P. robinsoni* SSF 234.5. E1. PEM 2042 - R. 5.18 mm OD, 219 mm TL. E2. PEM 0033 - R. 5.96 mm OD. TRIPTERYGIIDAE 390. F. *Cremnochorites capensis* SSF 236.1. F1. PEM 6056 (RUSI 17134) - R. 1.5 mm OD, 35 mm TL. F2. PEM 6055 (RUSI 17134) - L. 2.1 mm OD, 51 mm TL. F3. PEM 6054 (RUSI 17134) - L. 2.9 mm OD, 73 mm TL. G. *Helcogramma obtusirostre* SSF 236.8. G1. PEM 2919 - L. 1.05 mm OD, 25 mm TL. G2. PEM 2684 - L. 1.3 mm OD, 36 mm TL. Scale bars 1 mm (—).



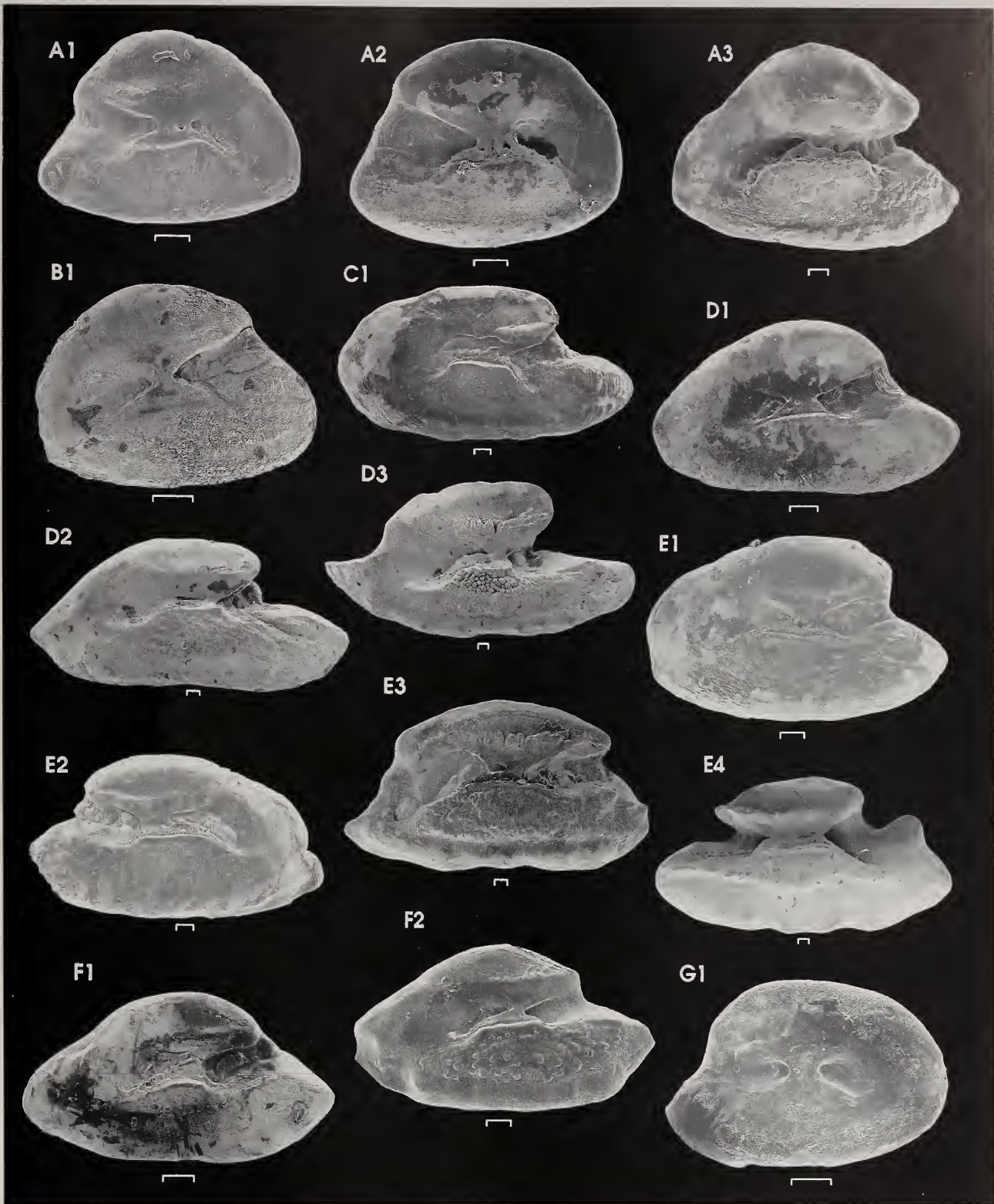


Plate 122. CLINIDAE 393. A. *Blennioclampus brachycephalus* SSF 237.1. A1. PEM 10393 - R. 0.8 mm OD, 50 mm TL. A2. PEM 10299 - R. 0.9 mm OD, 72 mm TL. A3. PEM 6024 - L. 1.5 mm OD, 97 mm TL. B. *B. stella* SSF 237.2. B1. PEM 5509 - L. 0.75 mm OD, 45 mm TL. C. *Blennophis anguillaris* SSF 237.3. C1. PEM 9982 - L. 2.2 mm OD, 118 mm TL. D. *B. striatus* SSF 237.4. D1. PEM 5178 (RUSI 11948) - L. 1.15 mm OD, 54 mm TL. D2. PEM 10072 - L. 2.7 mm OD, 97 mm TL. D3. PEM 10759 - L. 3.2 mm OD, 146 mm TL. E. *Cirrhobarbis capensis* SSF 237.7. E1. PEM 10268 - L. 1.3 mm OD, 61 mm TL. E2. PEM 10754 - R. 1.9 mm OD, 87 mm TL. E3. PEM 10266 - L. 2.5 mm OD, 124 mm TL. E4. PEM 2534 - L. 2.95 mm OD, 219 mm TL. F. *Climacoporus navalis* SSF 237.8. F1. PEM 10462 - L. 1.1 mm OD, 70 mm TL. F2. PEM 10460 - L. 1.3 mm OD, 57 mm TL. G. *Clinoporus biporosus* SSF 237.9. G1. PEM 5357 - R. 0.7 mm OD, 41 mm TL. Scale bars 0.1 mm (—).



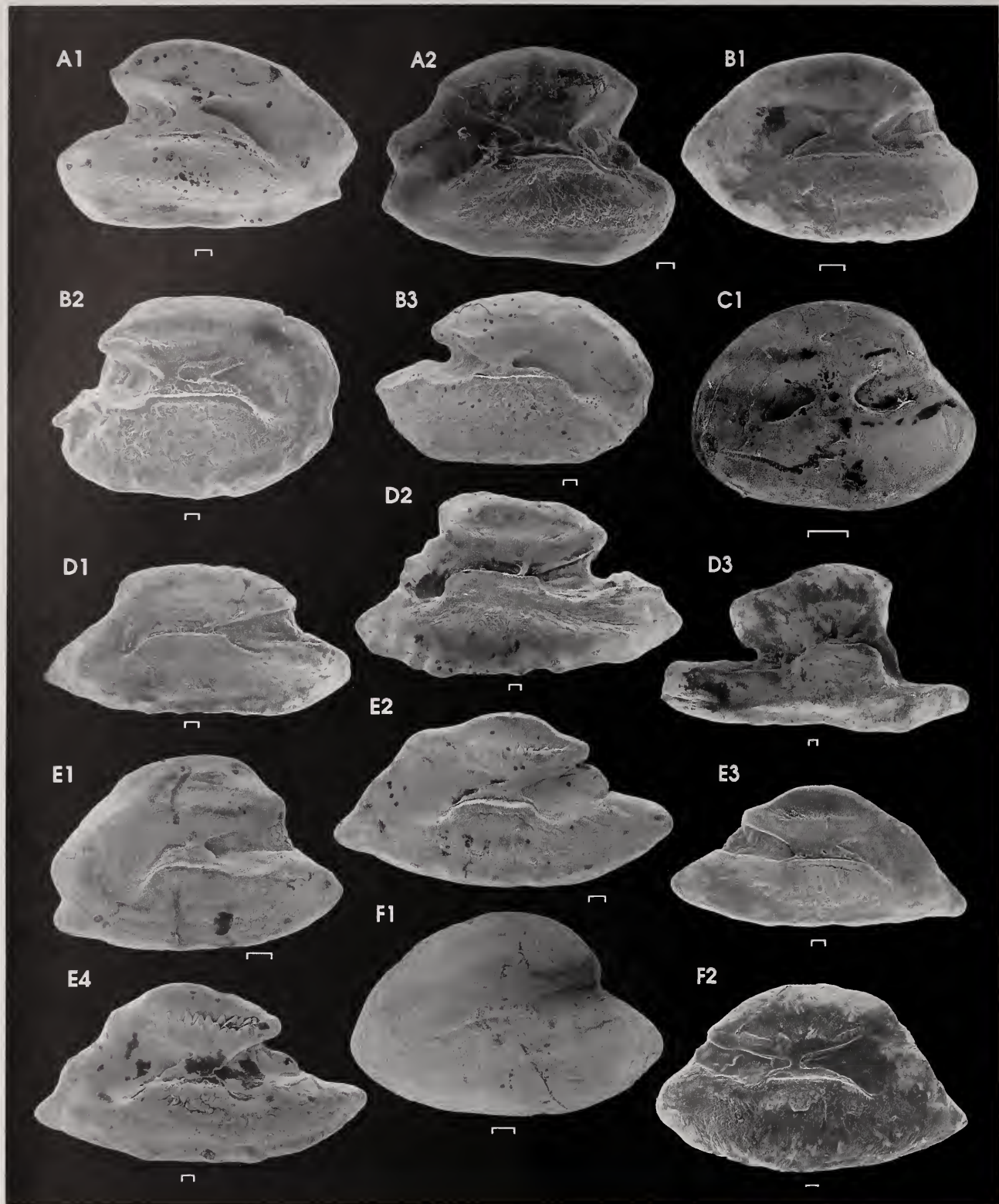


Plate 123. CLINIDAE 393 ctd. A. *Clinus berrisfordi* SSF 237.12. A1. PEM 2293 - R. 1.9 mm OD, 108 mm TL. A2. PEM 10906 - L. 1.9 mm OD, 96 mm TL. B. *C. cottoides* SSF 237.14. B1. PEM 5533 - L. 1.23 mm OD, 48 mm TL. B2. PEM 10471 - R. 2.2 mm OD, 96 mm TL. B3. PEM 5295 - R. 2.4 mm OD, 105 mm TL. C. *C. helenae* SSF 237.15. C1. PEM 14823 - L. 0.8 mm OD, 27 mm TL. D. *C. robustus* SSF 237.19. D1. PEM 10896 - L. 2.3 mm OD, 150 mm TL. D2. PEM 0646 - L. 3.0 mm OD, 285 mm TL. D3. PEM 10894 - L. 3.8 mm OD, 332 mm TL. E. *C. superciliosus* SSF 237.22. E1. PEM 5285 - L. 1.3 mm OD, 62 mm TL. E2. PEM 10098 - L. 2.2 mm OD, 107 mm TL. E3. PEM 3880 (RUSI 11955) - R. 2.35 mm OD, 132 mm TL. E4. PEM 5291 - L. 3.0 mm OD, 185 mm TL. F. *C. taurus* SSF 237.23. F1. PEM 10023 - L. 1.6 mm OD, 60 mm TL. F2. PEM 10017 - R. 2.7 mm OD, 122 mm TL. Scale bars 0.1 mm (—).



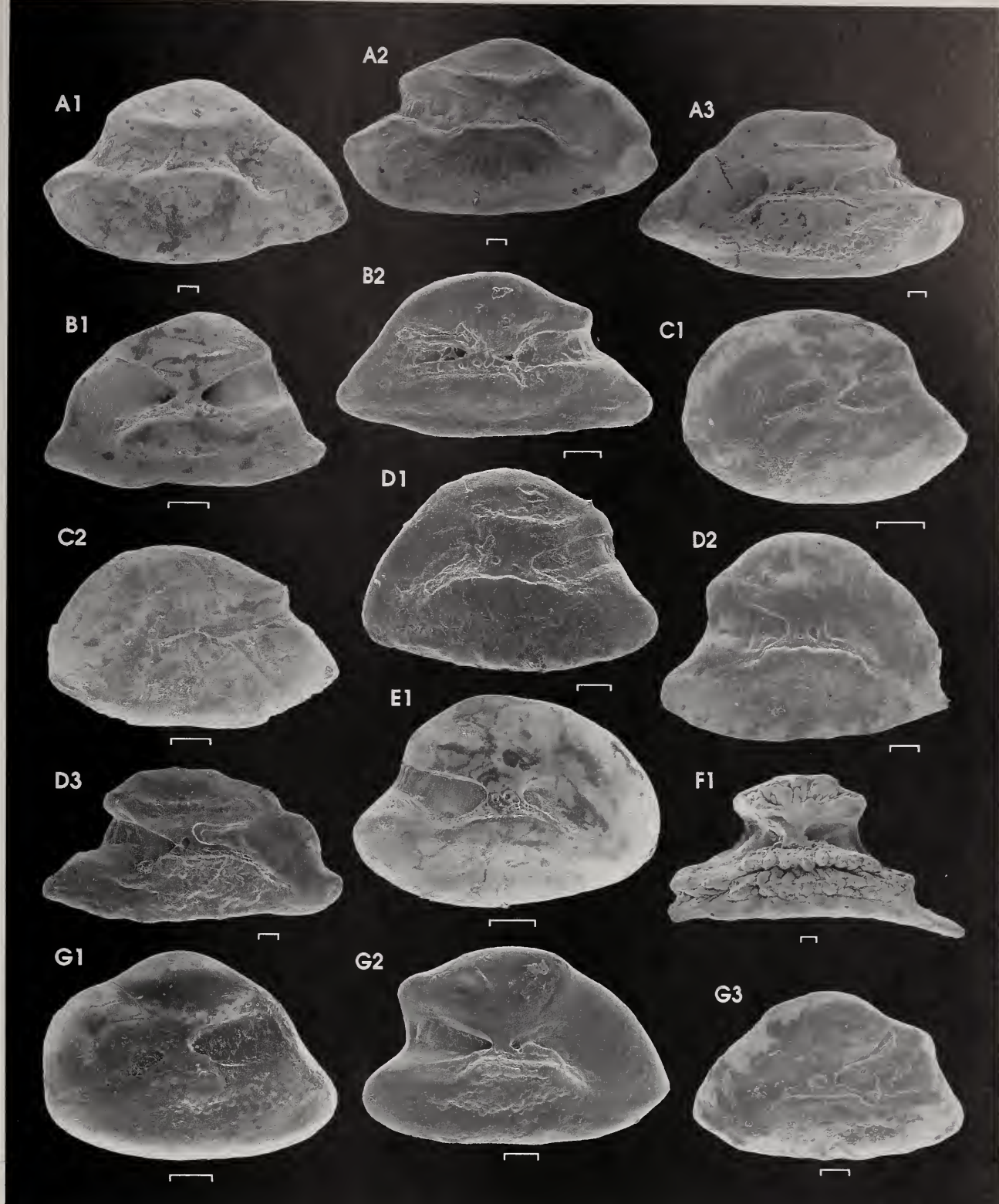


Plate 124. CLINIDAE 393 ctd. A. *Clinus venustis* SSF 237.24. A1. PEM 6047 (RUSI 17133) - R. 1.5 mm OD, 80 mm TL. A2. PEM 9980 - R. 1.8 mm OD, 78 mm TL. A3. PEM 6045 (RUSI 17133) - L. 2.0 mm OD, 96 mm TL. B. *Fucominus mus* SSF 237.26. B1. PEM 5506 - L. 0.8 mm OD, 72 mm TL. B2. PEM 5505 - L. 0.93 mm OD, 84 mm TL. C. *Muraenoclinus dorsalis* SSF 237.27. C1. PEM 2563 - L. 0.6 mm OD, 38 mm TL. C2. PEM 5321 - L. 0.75 mm OD, 41 mm TL. D. *Pavoclinus graminis* SSF 237.28. D1. PEM 5495 - L. 1.1 mm OD, 83 mm TL. D2. PEM 9963 - R. 1.2 mm OD, 73 mm TL. D3. PEM 10745 - R. 1.6 mm OD, 120 mm TL. E. *P. laurentii* SSF 237.30. E1. PEM 4106 - R. 0.7 mm OD, 41 mm TL. F. *P. mentalis* SSF 237.32. F1. PEM 0367 - L. 1.9 mm OD, 275 mm TL. G. *P. pavo* SSF 237.34. G1. PEM 6050 (RUSI 17129) - L. 0.7 mm OD, 44 mm TL. G2. PEM 9897 - R. 0.9 mm OD, 72 mm TL. G3. PEM 9894 - L. 1.1 mm OD, 68 mm TL. Scale bars 0.1 mm (—).



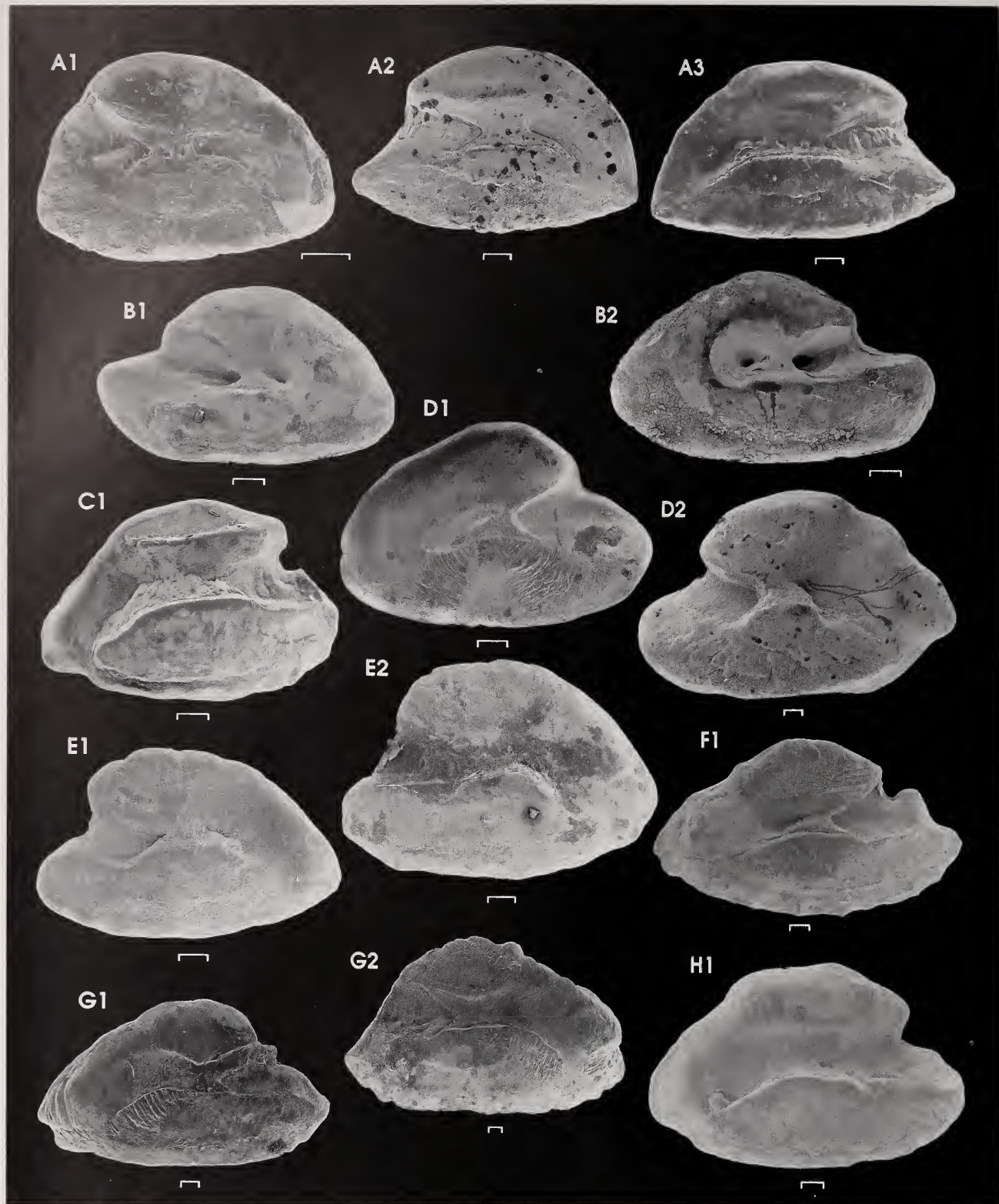


Plate 125. CLINIDAE 393 ctd. A. *Pavoclinus profundus* SSF 237.35. A1. PEM 6026 - R. 0.6 mm OD, 48 mm TL. A2. PEM 5358 - R. 1.1 mm OD, 52 mm TL. A3. PEM 6025 - L. 1.1 mm OD, 96 mm TL. B. *Xenopoclinus leprosus* SSF 237.38. B1. PEM 5359 - R. 0.95 mm OD, 60 mm TL. B2. PEM 5225 - L. 1.1 mm OD, 58 mm TL. BLENNIIDAE 395. C. *Antennablennius australis* SSF 235.2. C1. 0785H - L. 1.0 mm OD, 53 mm TL. D. *Chalaroderma ocellata* SSF 235.7. D1. PEM 5644 - L. 1.0 mm OD, 41 mm TL. D2. PEM 6044 - R. 1.8 mm OD, 88 mm TL. E. *Cirripectes castaneus* SSF 235.9. E1. 0481H - R. 1.1 mm OD, 53 mm TL. E2. 0480H - R. 1.2 mm OD, 70 mm TL. F. *Ecsenius midas* SSF 235.10. F1. 0759H - L. 1.55 mm OD, 89 mm TL. G. *Exallias brevis* SSF 235.14. G1. PEM 15655 - L. 1.65 mm OD, 64 mm TL. G2. PEM 15654 - R. 2.05 mm OD, 95 mm TL. H. *Istiblennius dussumieri* SSF 235.17 - H1. 0478H - L. 1.3 mm OD, 107 mm TL. Scale bars 0.1 mm (┌─┐).



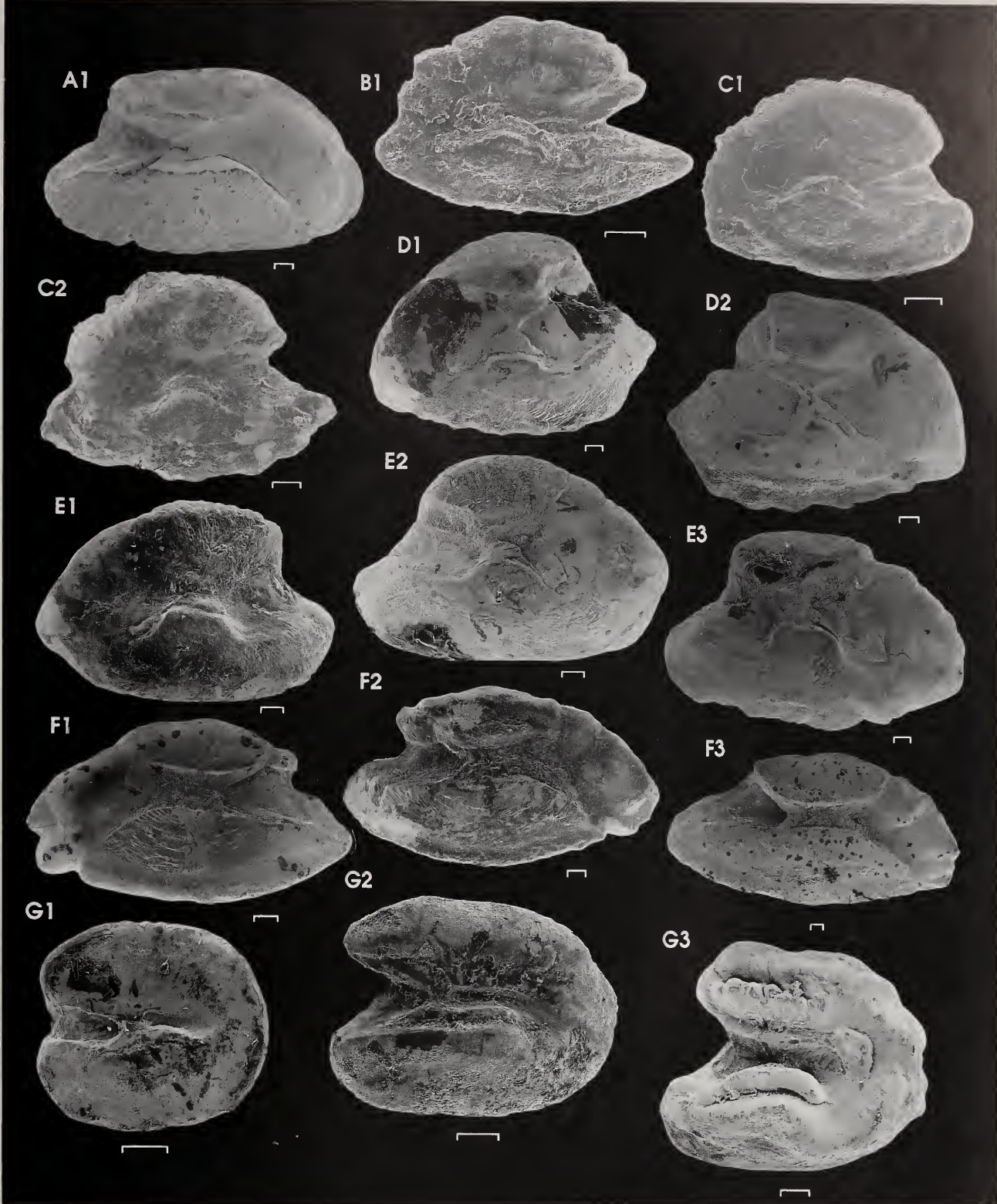


Plate 126. **BLENNIIDAE** 395 ctd. **A.** *Istiblennius edentulus* SSF 235.18. **A1.** 0639H - R. 1.8 mm OD, 125 mm TL. **B.** *Omobranchus banditus* SSF 235.25. **B1.** 0237H - L. 0.8 mm OD, 75 mm TL. **C.** *O. woodi* SSF 235.30. **C1.** PEM 1882 (RUSI 9028) - L. 0.75 mm OD, 75 mm TL. **C2.** PEM 1885 (RUSI 9029) - L. 1.05 mm OD, 57 mm TL. **D.** *Parablennius cornutus* SSF 235.31. **D1.** PEM 9998 - L. 1.5 mm OD, 47 mm TL. **D2.** PEM 9996 - R. 1.6 mm OD, 82 mm TL. **E.** *P. pilicornis* SSF 235.33. **E1.** PEM 1105 - L. 1.45 mm OD, 57 mm TL. **E2.** PEM 1104 - R. 1.5 mm OD, 74 mm TL. **E3.** PEM 1103 - R. 1.85 mm OD, 104 mm TL. **F.** *Pereulixia kosiensis* SSF 235.34. **F1.** 0924H - L. 1.45 mm OD, 65 mm TL. **F2.** PEM 2681 - R. 1.85 mm OD. **F3.** 0791H - R. 2.5 mm OD, 127 mm TL. **G.** *Plagiotrenus tapeinosoma* SSF 235.38. **G1.** PEM 2621 - R. 0.55 mm OD, 48 mm TL. **G2.** 0704H - R. 0.85 mm OD, 64 mm TL. **G3.** 0460H - R. 0.95 mm OD, 105 mm TL. Scale bars 0.1 mm (┐).



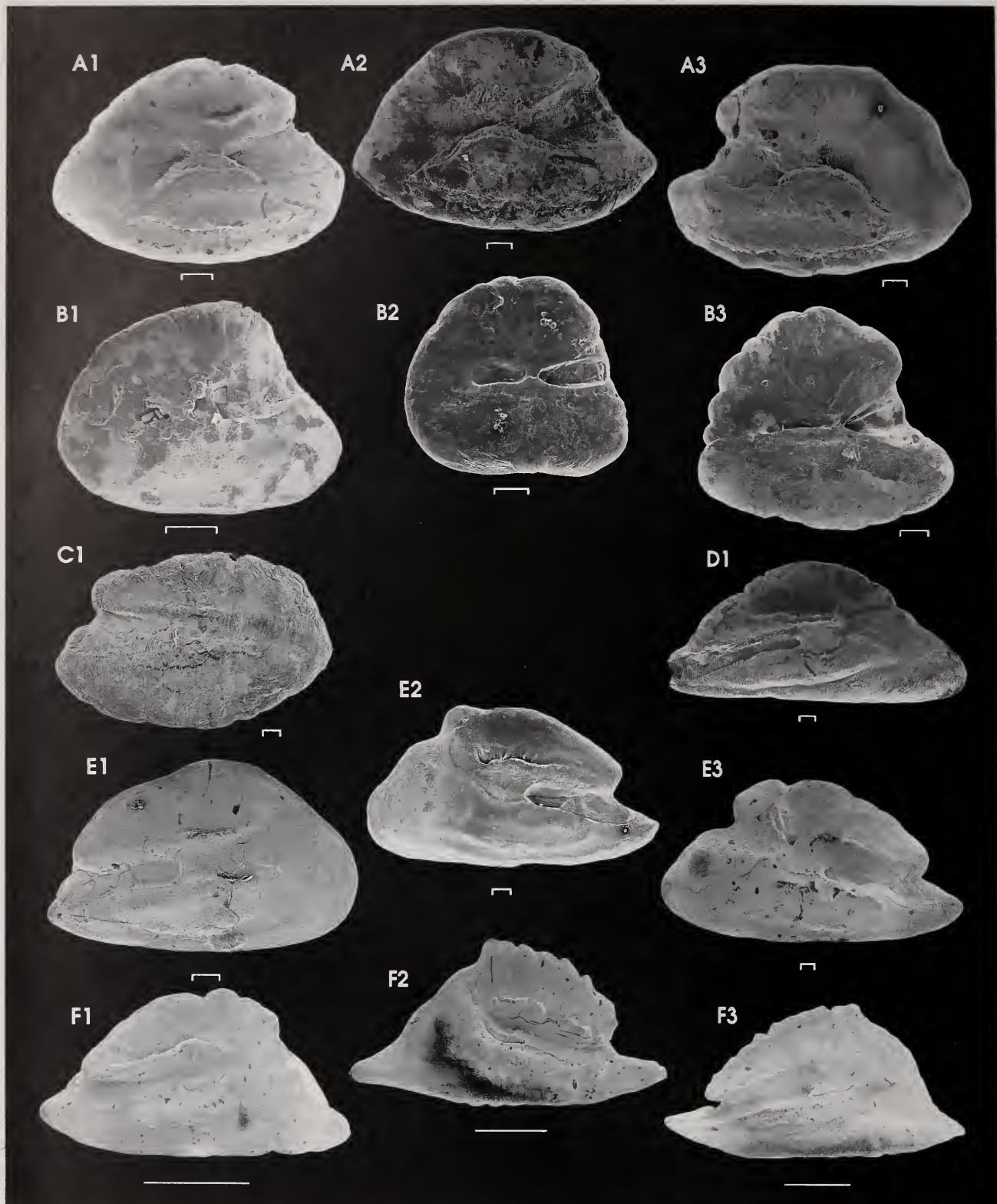


Plate 127. BLENNIIDAE 395 ctd. A. *Scartella emarginata* SSF 235.40. A1. PEM 1102 - L. 0.95 mm OD, 55 mm TL. A2. PEM 1098 - L. 1.25 mm OD, 62 mm TL. A3. PEM 1101 - R. 1.38 mm OD, 71 mm TL. B. *Xiphasia setifer* SSF 235.42. B1. PEM 8294 - L. 0.55 mm OD, 255 mm TL. B2. PEM 0475 (RUSI 4413) - L. 0.7 mm OD, 315 mm TL. B3. PEM 14655 - L. 1.0 mm OD, 455 mm TL. AMMODYTIDAE 398. C. *Gymnammodytes capensis* SSF 238.2. C1. PEM 0197 - R. 1.55 mm OD, 67 mm TL. CALLIONYMIDAE 399. D. *Callionymus filamentosus* SSF 239.1. D1. PEM 15443 (RUSI 40561) - R. 2.0 mm OD, 91 mm TL. E. *Paracallionymus costatus* SSF 239.6. E1. PEM 7326 - R. 1.5 mm OD, 44 mm TL. E2. PEM 3190 (RUSI 12175) - L. 1.75 mm OD, 87 mm TL. E3. PEM 12547 (RUSI 28463) - L. 2.3 mm OD. F. *Synchiropus monacanthus* SSF 239.8. F1. PEM 13038 (RUSI 28462) - R. 3.2 mm OD, 109 mm TL. F2. PEM 13004 (RUSI 28462) - L. 4.7 mm OD, 205 mm TL. F3. PEM 13063 - R. 5.0 mm OD, 185 mm TL. Scale bars 0.1 mm (—) or 1 mm (—).



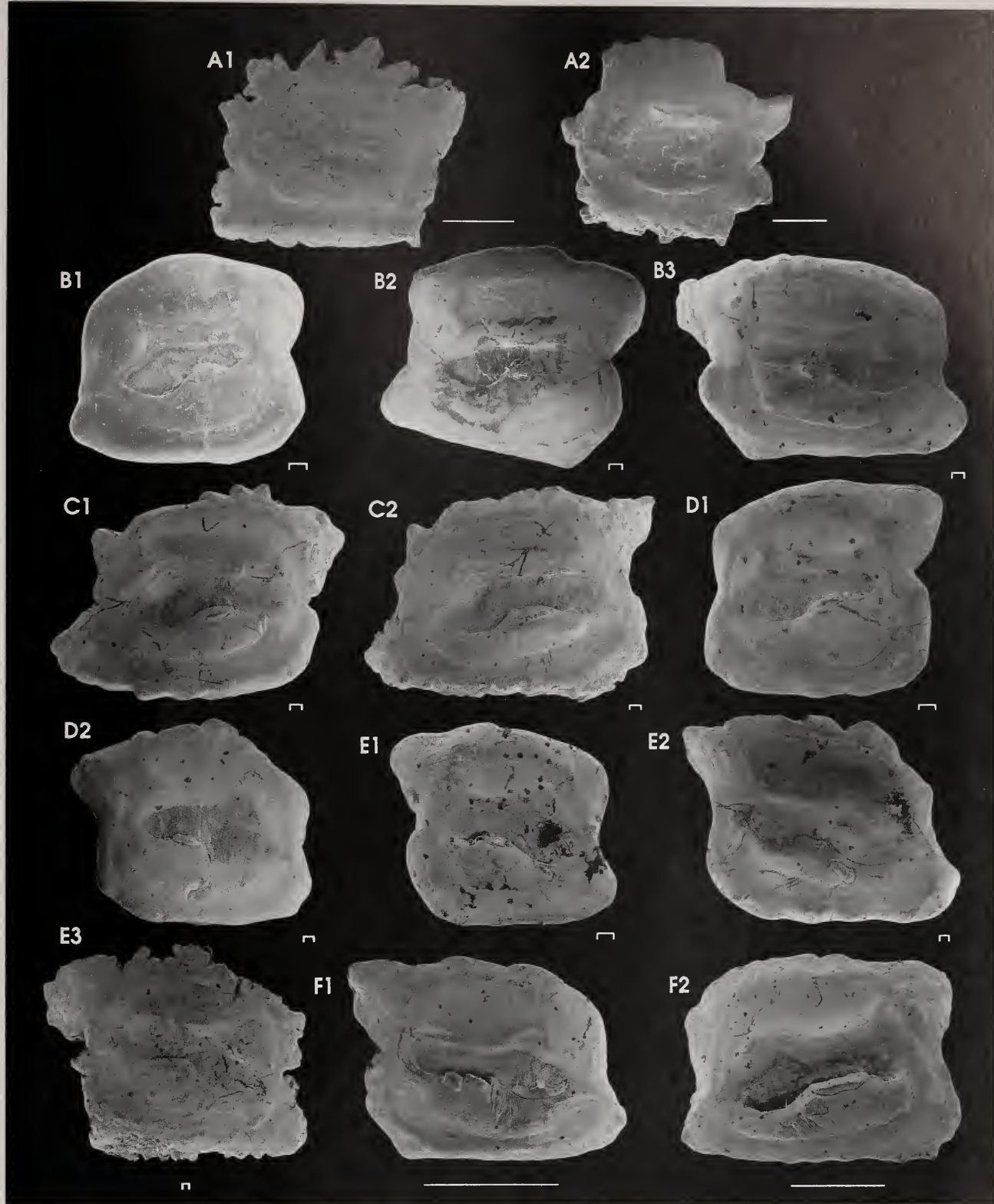


Plate 128. ELEOTRIDIDAE 402. A. *Eleotris fusca* SSF 241.4. A1. PEM 0303 (RUSI 4337) - R. 3.9 mm OD, 153 mm TL. A2. PEM 15486 (RUSI 40625) - R. 4.75 mm OD, 200 mm TL. GOBIIDAE 403. B. *Caffrogobius agulhensis* SSF 240.19. B1. PEM 4691 - R. 1.35 mm OD, 37 mm TL. B2. PEM 6063 - R. 1.7 mm OD, 52 mm TL. B3. PEM 6061 - L. 2.2 mm OD, 68 mm TL. C. *C. caffer* SSF 240.20. C1. PEM 5331 - R. 2.4 mm OD, 75 mm TL. C2. PEM 5294 - R. 2.7 mm OD, 86 mm TL. D. *C. multifasciatus* SSF 240.21. D1. 1418H - R. 1.5 mm OD, 40 mm TL. D2. 1417H - L. 2.35 mm OD, 58 mm TL. E. *C. nudiceps* SSF 240.23. E1. PEM 4043 - L. 1.4 mm OD, 36 mm TL. E2. PEM 4062 - L. 3.0 mm OD, 95 mm TL. E3. PEM 0073 - L. 4.15 mm OD. F. *C. saldanha* SSF 240.24. F1. PEM 10468 - L. 3.1 mm OD, 75 mm TL. F2. PEM 10004 - R. 3.4 mm OD, 87 mm TL. Scale bars 0.1 mm (┐) or 1 mm (—).

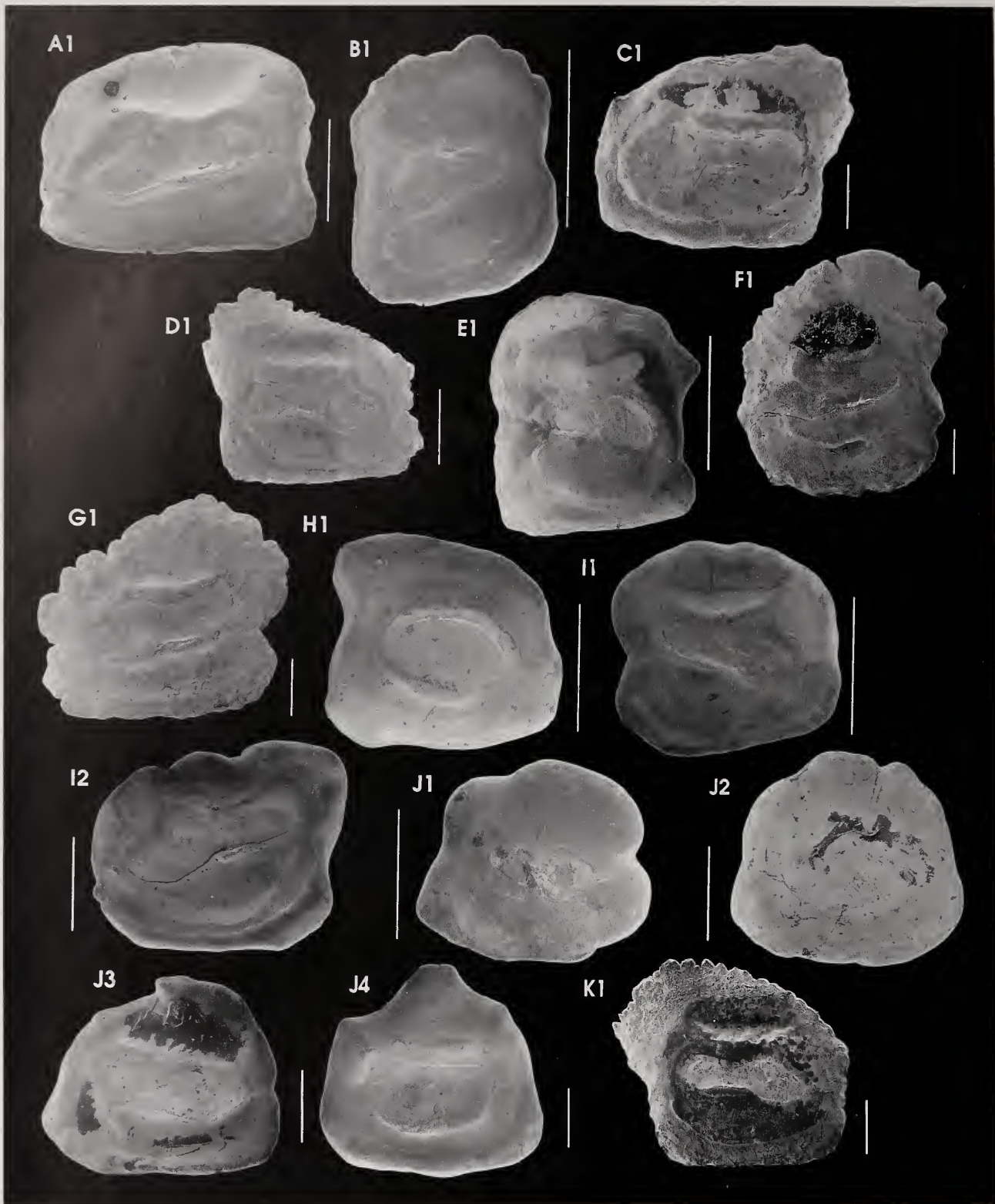


Plate 129. GOBIIDAE 403 etd. A. *Glossogobius callidus* SSF 240.43. A1. 0793H - R. 2.75 mm OD, 96 mm TL. B. *Gobiodon citrinus* SSF 240.47. B1. 1039H - R. 1.5 mm OD, 42 mm TL. C. *Istigobius decoratus* SSF 240.56. C1. PEM 6742 (RUSI 28464) - R. 4.4 mm OD, 129 mm TL. D. *I. ornatus* SSF 240.57. D1. PEM 4355 - L. 3.15 mm OD, 93 mm TL. E. *Nemateleotris magnifica* SSF 240.64. E1. PEM 2868 - L. 1.8 mm OD, 74 mm TL. F. *Oxyurichthys papuensis* SSF 240.71. F1. PEM 15446 (RUSI 40564) - L. 5.74 mm OD, 195 mm TL. G. *Parachaeturichthys polynema* SSF 240.73. G1. PEM 0229 - R. 4.8 mm OD, 115 mm TL. H. *Priolepis cincta* SSF 240.84. H1. PEM 4356 - L. 1.95 mm OD, 49 mm TL. I. *Psammogobius knysnaensis* SSF 240.87. I1. 1411H - L. 1.65 mm OD, c.50 mm TL. I2. 0218H - R. 2.45 mm OD, 101 mm TL. J. *Sufflogobius bibarbatus* SSF 240.97. J1. PEM 14679 - L. 1.9 mm OD, 72 mm TL. J2. PEM 7794 (RUSI 28466) - L. 2.8 mm OD, 102 mm TL. J3. PEM 10957 - L. 3.2 mm OD, 113 mm TL. J4. PEM 14674 - R. 4.2 mm OD, 159 mm TL. K. *Yongeichthys nebulosus* SSF 240.107. K1. PEM 15445 (RUSI 40563) - L. 5.12 mm OD, 107 mm TL. Scale bars 1 mm (—).



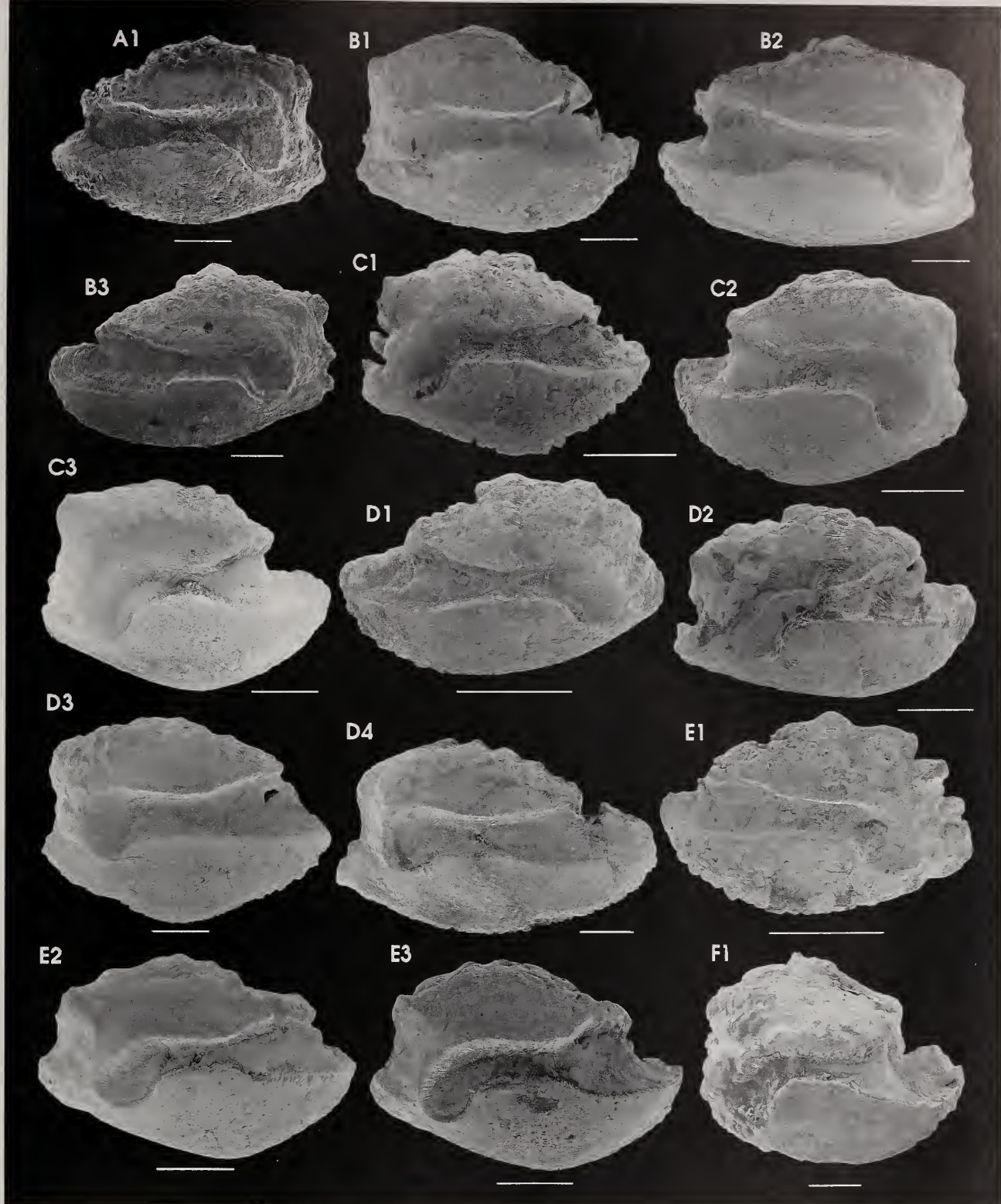


Plate 130. ACANTHURIDAE 409. A. *Acanthurus blochii* SSF 243.1. A1. PEM 15406 (RUSI 40613) - R. 5.0 mm OD, 242 mm TL. B. *A. dussumieri* SSF 243.2. B1. PEM 2668 - L. 5.32 mm OD, 260 mm TL. B2. PEM 5995 - R. 6.1 mm OD, 284 mm FL. B3. PEM 15407 (RUSI 40612) - R. 5.86 mm OD, 256 mm TL. C. *A. leucosternon* SSF 243.3. C1. PEM 6985 - L. 3.3 mm OD, 93 mm TL. C2. PEM 6132 (RUSI 17178) - R. 3.5 mm OD, 118 mm TL. C3. PEM 6453 - L. 4.6 mm OD, 182 mm TL. D. *A. lineatus* SSF 243.4. D1. PEM 0482 - R. 3.0 mm OD, 92 mm SL. D2. PEM 2669 - L. 4.05 mm OD, 200 mm TL. D3. PEM 0732 - L. 5.58 mm OD, 200 mm TL. D4. PEM 0731 - L. 6.34 mm OD, 300 mm TL. E. *A. nigrofasciatus* SSF 243.7. E1. PEM 2717 - R. 2.85 mm OD, 87 mm TL. E2. PEM 8328 (RUSI 37432) - L. 4.3 mm OD, 125 mm TL. E3. PEM 6689 (RUSI 28465) - L. 4.4 mm OD, 132 mm TL. F. *A. tententii* SSF 243.9. F1. PEM 2894 - L. 5.82 mm OD, 310 mm TL. Scale bars 1 mm (—).



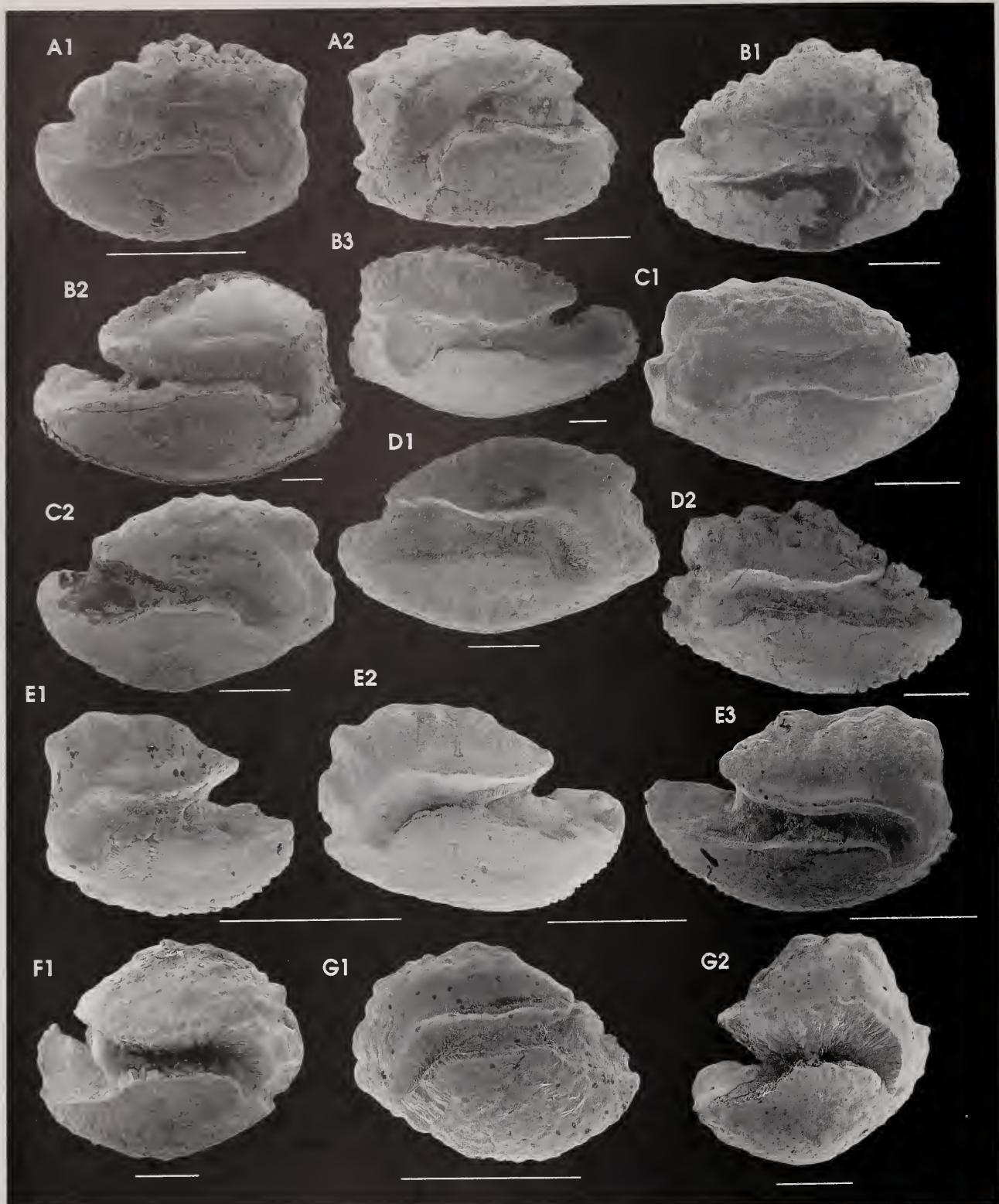


Plate 131. ACANTHURIDAE 409 ctd. **A.** *Acanthurus triostegus* SSF 243.11. **A1.** PEM 5433 - R. 2.0 mm OD, 67 mm TL. **A2.** PEM 2836 - L. 3.35 mm OD, 161 mm TL. **B.** *A. xanthopterus* SSF 243.12. **B1.** PEM 6648 (RUSI 28468) - R. 4.35 mm OD, 181 mm TL. **B2.** PEM 5997 - R. 5.1 mm OD, 178 mm TL. **B3.** PEM 14862 - L. 8.5 mm OD, 537 mm TL. **C.** *Ctenochaetus striatus* SSF 243.14. **C1.** PEM 14829 (RUSI 37091) - L. 4.0 mm OD, 123 mm TL. **C2.** PEM 14267 - R. 4.4 mm OD, 147 mm TL. **D.** *C. strigosus* SSF 243.15. **D1.** PEM 14268 - R. 4.9 mm OD, 140 mm TL. **D2.** PEM 14563 (RUSI 31404) - L. 5.0 mm OD, 180 mm TL. **E.** *Paracanthurus hepatus* SSF 243.16. **E1.** PEM 7696 (RUSI 28471) - L. 1.7 mm OD, 46 mm TL. **E2.** PEM 0485 - L. 2.3 mm OD, 90 mm SL. **E3.** PEM 6781 - R. 2.8 mm OD, 133 mm TL. **F.** *Z. gemmatum* SSF 243.17. **F1.** PEM 14806 - R. 4.8 mm OD, 176 mm TL. **G.** *Zebrasoma scopas* SSF 243.18. **G1.** PEM 7698 (RUSI 28470) - L. 2.0 mm OD, 54 mm TL. **G2.** PEM 10625 - R. 3.4 mm OD, 175 mm TL. Scale bars 1 mm (—).



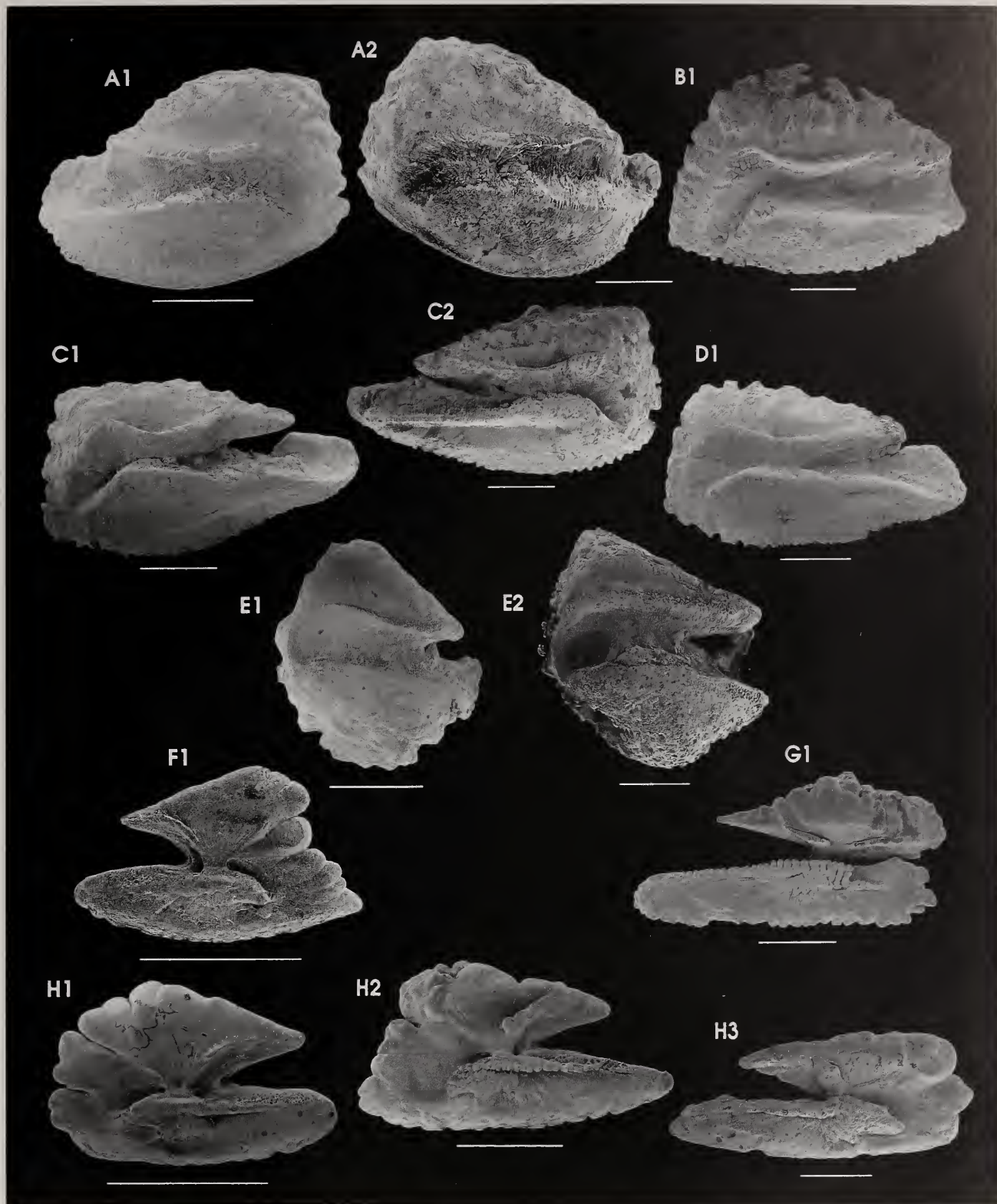


Plate 132. ACANTHURIDAE 409 ctd. A. *Zebrasoma veliferum* SSF 243.19. A1. PEM 6460 - R. 3.4 mm OD, 135 mm TL. A2. PEM 15031 (RUSI 35590) - L. 4.1 mm OD, 194 mm TL. B. *Naso annulatus* SSF 243.20. B1. PEM 0621 - L. c.5.0 mm OD, 490 mm TL. C. *N. brevirostris* SSF 243.22. C1. PEM 14560 (RUSI 34099) - L. 4.7 mm OD, 300 mm TL. C2. PEM 15661 - R. 5.0 mm OD, 255 mm TL. D. *N. tuberosus* SSF 243.29. D1. PEM 14535 - L. 4.9 mm OD, 331 mm TL. E. *Zanclus canescens* SSF 244.1. E1. PEM 11302 - L. 2.8 mm OD, 94 mm TL. E2. PEM 6761 - L. 3.9 mm OD, 204 mm TL. SIGANIDAE 410. F. *Siganus argenteus* SSF 245.-. F1. PEM 15394 (RUSI 40576) - R. 1.85 mm OD, 110 mm TL. G. *S. stellatus* SSF 245.1. G1. 1171H - R. 4.25 mm OD, 260 mm TL. H. *S. sutor* SSF 245.2. H1. PEM 0178 - L. 1.85 mm OD, 102 mm TL. H2. PEM 14551 (RUSI 31449) - L. 3.2 mm OD, 192 mm TL. H3. PEM 0326 - R. 4.15 mm OD, 305 mm TL. Scale bars 1 mm (—).

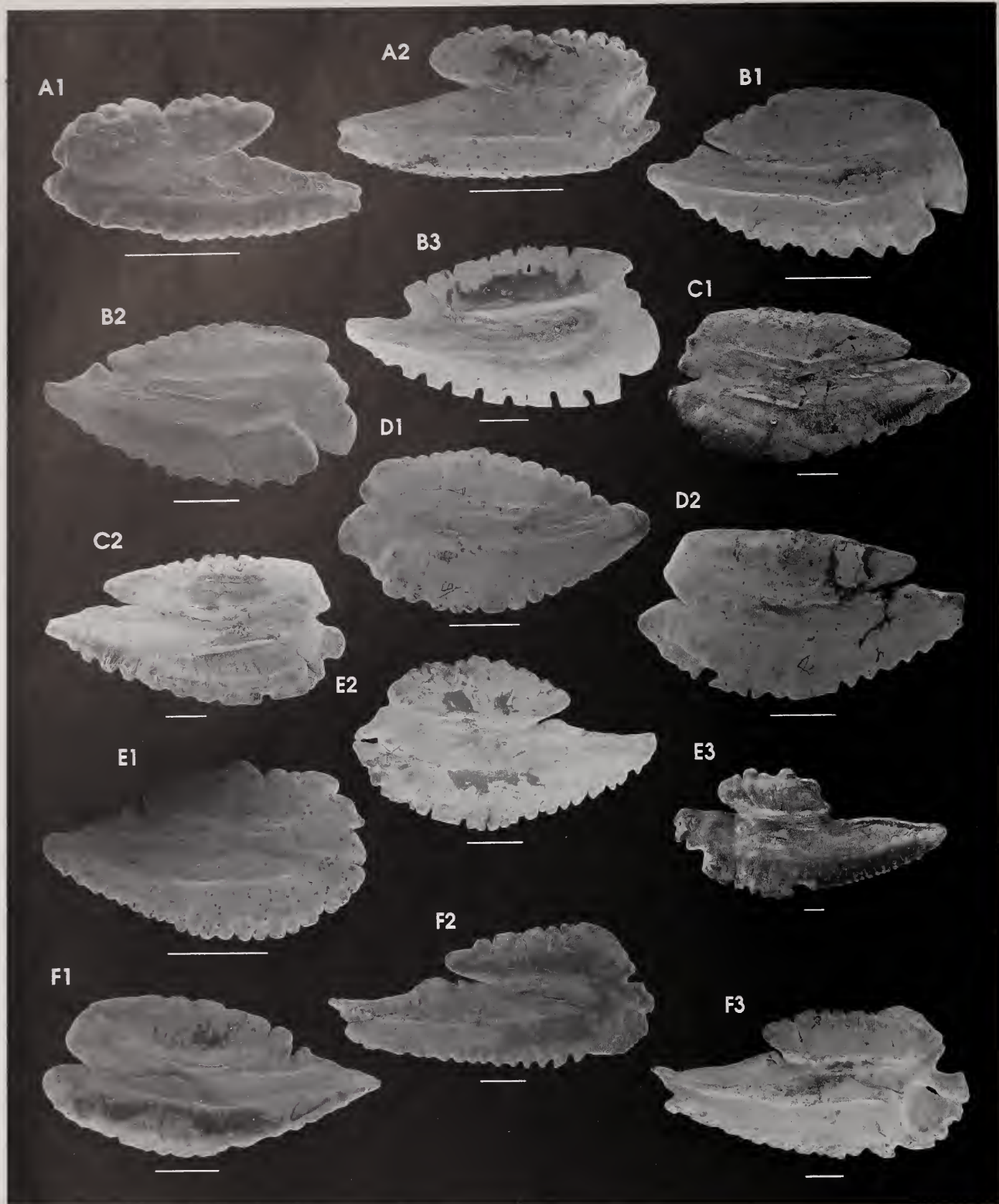


Plate 133. GEMPYLIDAE 412. A. *Gempylus serpens* SSF 247.2. A1. PEM 9639 (RUSI 37443) - L. 2.8 mm OD, 367 mm TL. A2. PEM 14332 - R. 3.6 mm OD, 470 mm TL. B. *Neopinnula orientalis* SSF 247.4. B1. PEM 14427 (RUSI 28473) - R. 4.3 mm OD, 127 mm TL. B2. PEM 12472 (RUSI 34080) - R. 5.4 mm OD, 170 mm TL. B3. PEM 13008 - R. 7.1 mm OD, 245 mm TL. C. *Promethichthys prometheus* SSF 247.-. C1. PEM 15342 - L. 7.72 mm OD, 320 mm SL. C2. PEM 15340 - R. 7.96 mm OD, 330 mm SL. D. *Rexea prometheoides* SSF 247.6. D1. PEM 13329 - L. 4.5 mm OD, 167 mm TL. D2. PEM 12768 (RUSI 28484) - L. 5.5 mm OD, 210 mm TL. E. *Thyrstites atun* SSF 247.8. E1. PEM 7376 (RUSI 34157) - R. 3.5 mm OD, 152 mm TL. E2. PEM 3589 - L. 6.04 mm OD, 330 mm TL. E3. PEM 1253 - L. 14.28 mm OD, 950 mm SL. F. *Thyrstoides marleyi* SSF 247.9. F1. PEM 5065 - L. 5.64 mm OD, 205 mm TL. F2. PEM 14449 - R. 7.4 mm OD, 719 mm TL. F3. PEM 14868 (RUSI 35537) - R. 8.5 mm OD, 987 mm TL. Scale bars 1 mm (—).



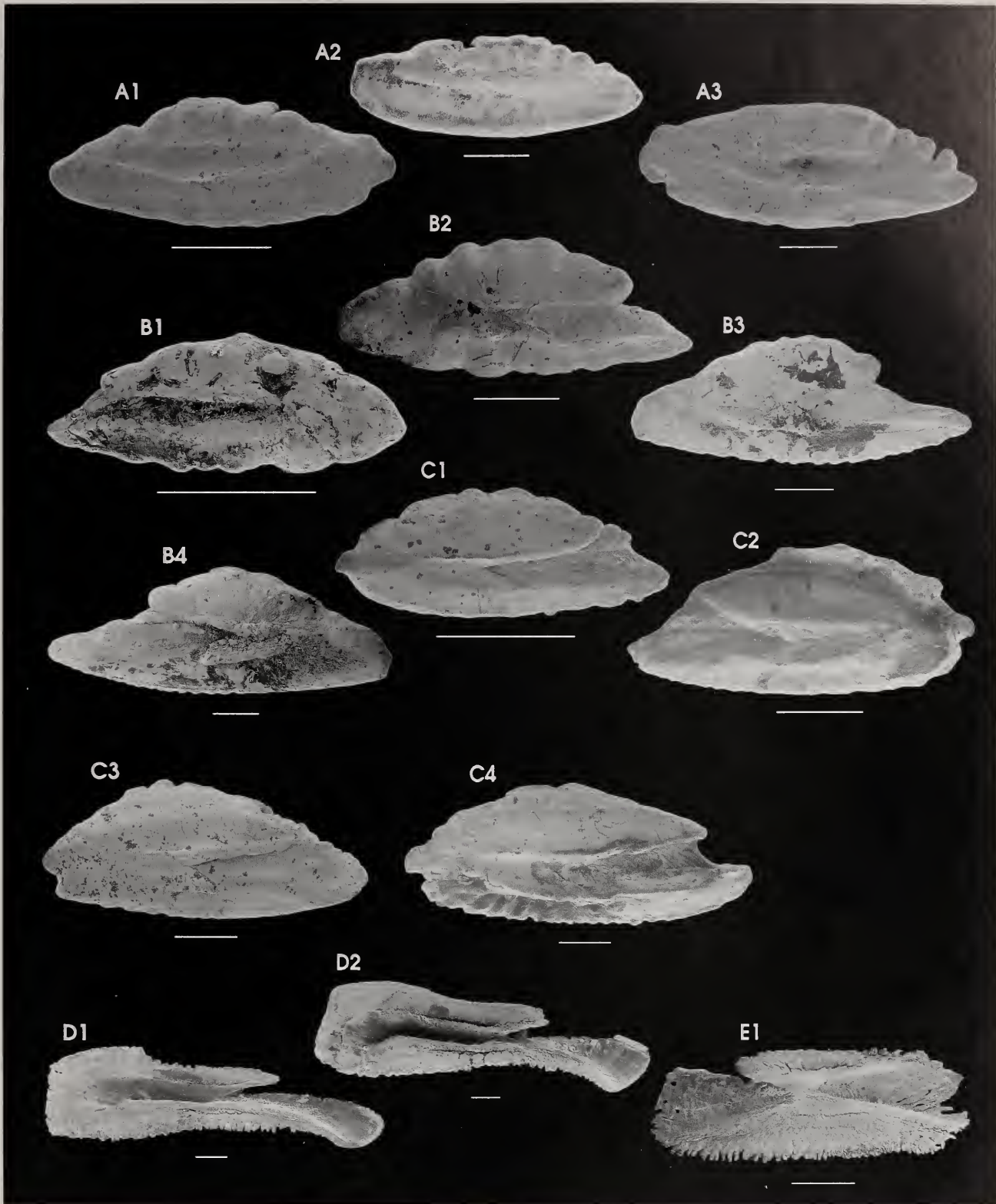


Plate 134. TRICHIURIDAE 413. A. *Benthodesmus elongatus elongatus* SSF 248.3. A1. PEM 5052 (RUSI 14050) - R. 3.45 mm OD, 400 mm TL. A2. PEM 14906 (RUSI 35573) - L. 4.5 mm OD, 650 mm TL. A3. PEM 13427 - L. 6.1 mm OD, 872 mm TL. B. *Lepidopus caudatus* SSF 248.4. B1. PEM 7500 (RUSI 28472) - R. 2.3 mm OD, 227 mm TL. B2. PEM 12225 - L. 4.2 mm OD, 574 mm TL. B3. PEM 9588 - L. 6.0 mm OD, 835 mm TL. B4. PEM 3940 - R. 7.68 mm OD, 2630 mm TL. C. *Trichiurus lepturus* SSF 248.6. C1. PEM 1707 - L. 2.35 mm OD, 246 mm TL. C2. PEM 11721 (RUSI 28492) - R. 4.1 mm OD, 482 mm TL. C3. PEM 12735 - L. 5.4 mm OD, 790 mm TL. C4. PEM 1708 - L. 7.06 mm OD, 748 mm TL. SCOMBRIDAE 414. D. *Acanthocybium solandri* SSF 249.1. D1. PEM 1853 - L. 11.16 mm OD, 1216 mm FL. D2. PEM 6115 - L. 12.2 mm OD, 1590 mm FL. E. *Euthynnus affinis* SSF 249.4. E1. PEM 15561 - R. 5.0 mm OD, 570 mm TL. Scale bars 1 mm (—).

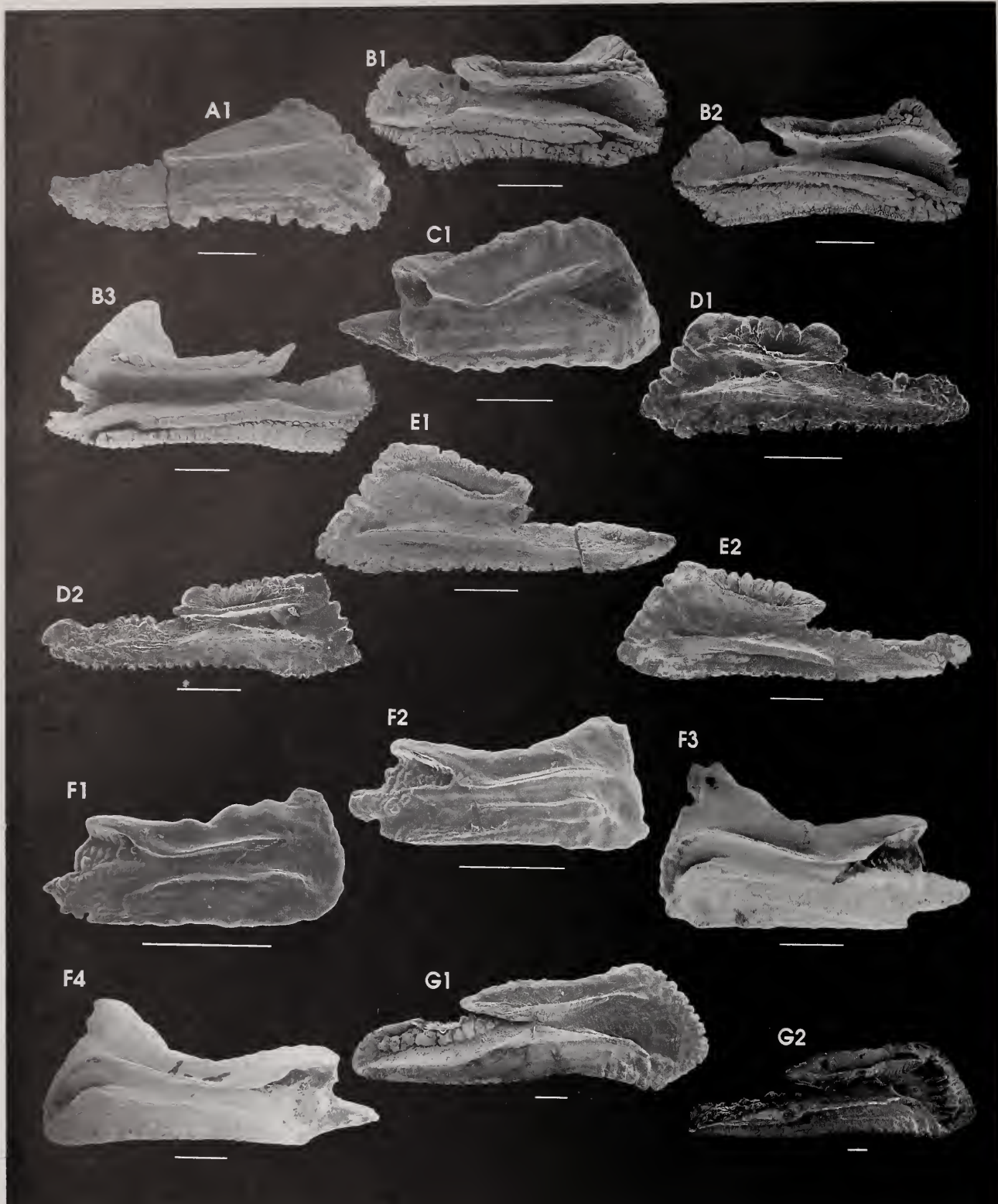


Plate 135. SCOMBRIDAE 414 ctd. A. *Gymnosarda unicolor* SSF 249.6. A1. PEM 14564 - R. 6.0 mm OD, 605 mm TL. B. *Katsuwonis pelamis* SSF 249.7. B1. PEM 0805 - R. 4.75 mm OD, 600 mm TL. B2. PEM 0989 - R. 5.64 mm OD, 580 mm FL. B3. PEM 15680 - L. 6.18 mm OD, 620 mm FL. C. *Rastrelliger kanagurta* SSF 249.8. C1. PEM 5976 - R. 4.3 mm OD, 224 mm FL. D. *Sarda orientalis* SSF 249.9. D1. PEM 15466 - L. 4.25 mm OD, 460 mm TL. D2. PEM 15465 - R. 5.26 mm OD, 432 mm TL. E. *S. sarda* SSF 249.10. E1. PEM 0988 - L. 5.78 mm OD, 470 mm FL. E2. PEM 6496 - L. 6.7 mm OD, 560 mm TL. F. *Scomber japonicus* SSF 249.11. F1. PEM 7310 (RUSI 28482) - R. 2.4 mm OD, 137 mm TL. F2. PEM 7311 (RUSI 28482) - R. 2.8 mm OD, 163 mm TL. F3. PEM 9412 - L. 5.2 mm OD, 150 mm FL. F4. PEM 9406 - L. 6.0 mm OD, 395 mm TL. G. *Scomberomorus commerson* SSF 249.12. G1. PEM 2697 - R. 12.38 mm OD. G2. PEM 2662 - R. 15.16 mm OD, 1074 mm FL. Scale bars 1 mm (—).



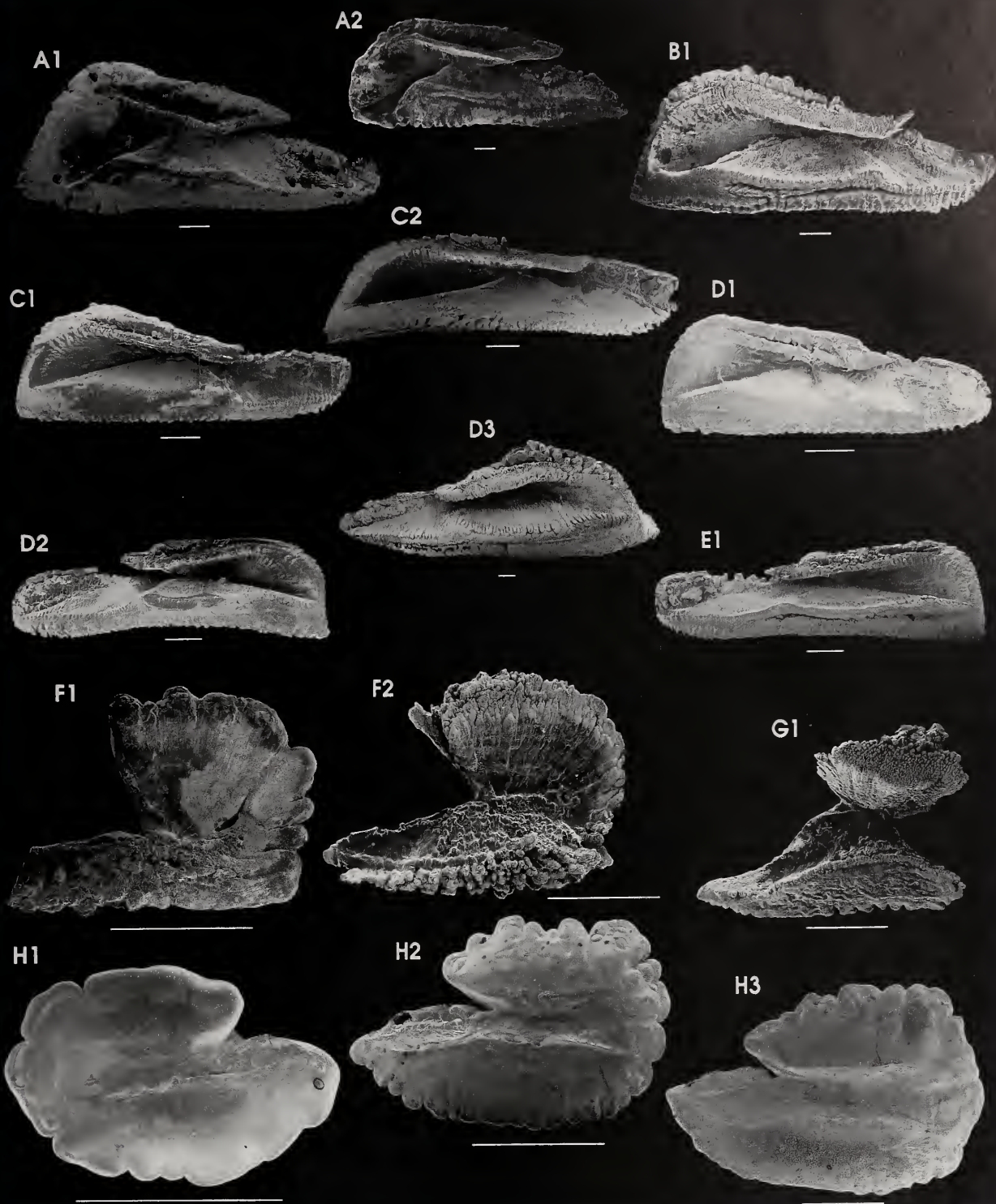


Plate 136. SCOMBRIDAE 414 ctd. A. *Scomberomorus plurilineatus* SSF 249.13. A1. PEM 8143 - L. 12.3 mm OD, 855 mm TL. A2. PEM 0470 - L. 14.06 mm OD. B. *Thunnus alalunga* SSF 249.14. B1. PEM 15467 - L. 12.58 mm OD. C. *T. albacares* SSF 249.15. C1. PEM 7466 - L. 8.8 mm OD, 605 mm FL. C2. PEM 0858 - L. 11.12 mm OD, 1110 mm TL. D. *T. maccoyii* SSF 249.16. D1. PEM 15065 - L. 6.8 mm OD, 400 mm FL. D2. PEM 15068 - R. 9.6 mm OD, 700 mm FL. D3. PEM 15064 - R. 21.4 mm OD, 1860 mm FL. E. *T. thynnus thynnus* SSF 249.18. E1. PEM 0981 - R. 9.64 mm OD. XIPHIIDAE 415. F. *Xiphias gladius* SSF 251.1. F1. PEM 1966 - R. c.2.1 mm OD, 3400 mm TL. F2. PEM 2087 - R. 2.9 mm OD. ISTIOPHORIDAE 417. G. *Makaira indica* SSF 252.2. G1. PEM 0726 - R. 3.4 mm OD, 3430 mm TL. NOMEIDAE 420. H. *Ariomma indica* SSF 255.1. H1. PEM 5108 - L. 1.55 mm OD, 51 mm TL. H2. PEM 4543 - R. 2.5 mm OD, 125 mm TL. H3. PEM 5107 - R. 4.0 mm OD, 77 mm TL. Scale bars 1 mm (—).

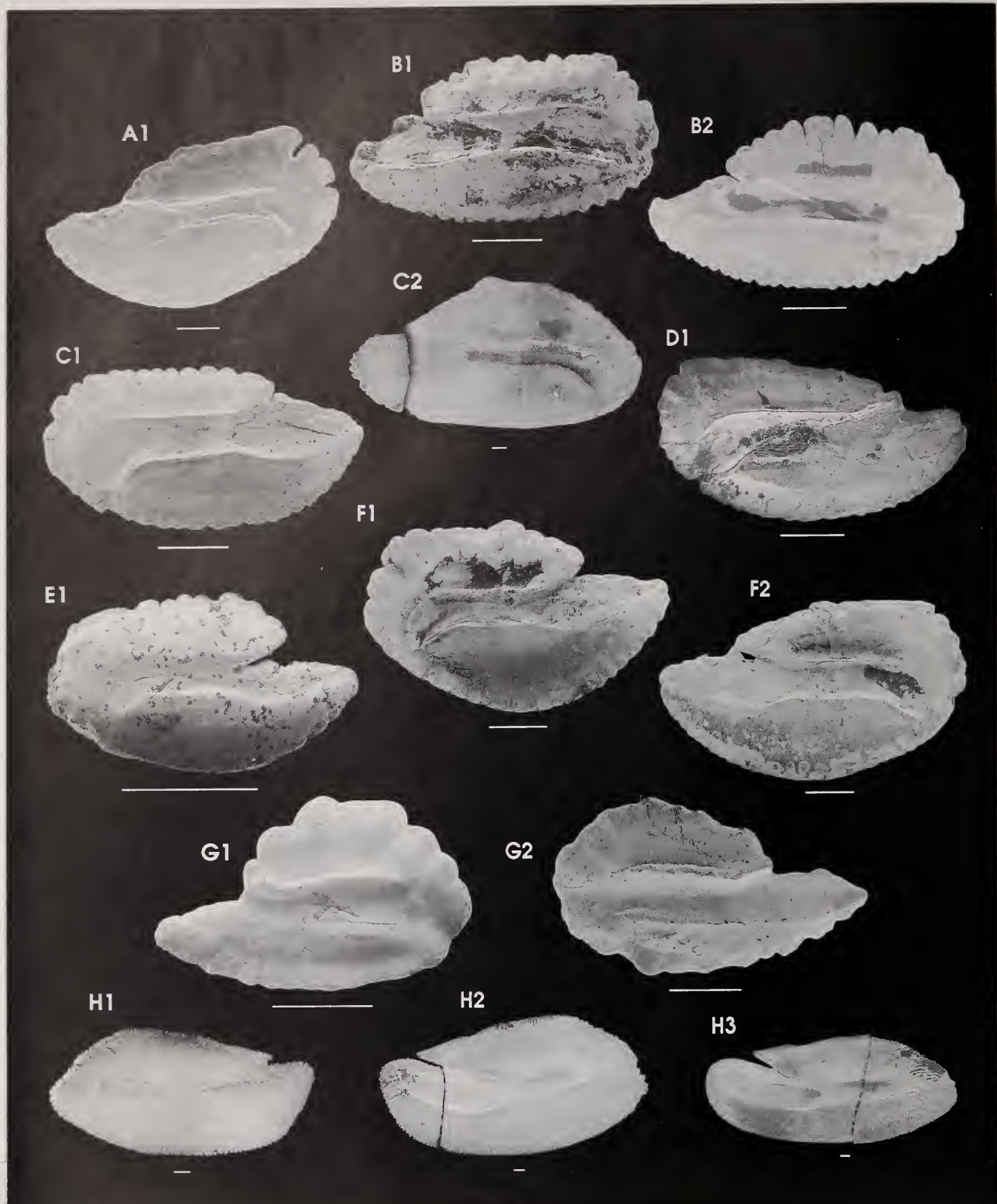


Plate 137. NOMEIDAE 420 etd. A. *Cubiceps baxteri* SSF 255.3. A1. PEM 14975 (RUSI 35584) - R. 7.1 mm OD, 195 mm TL. B. *C. caeruleus* SSF 255.4. B1. PEM 13613 - R. 4.7 mm OD, 170 mm TL. B2. PEM 14156 (RUSI 28485) - R. 5.4 mm OD, 192 mm TL. C. *C. capensis* SSF 255.5. C1. 1533H - L. 4.85 mm OD, 130 mm TL. C2. PEM 10362 - R. c.21.2 mm OD, 515 mm TL. D. *C. pauciradiatus* SSF 255.6. D1. PEM 0948 - L. 5.72 mm OD, c.106 mm TL. E. *Nomeus gronovii* SSF 255.7. E1. PEM 3936 - L. 2.3 mm OD, 68 mm TL. F. *Psenes whiteleggii* SSF 255.12. F1. PEM 12794 (RUSI 28486) - L. 5.7 mm OD, 151 mm TL. F2. PEM 12898 (RUSI 28483) - R. 6.9 mm OD, 177 mm TL. TETRAGONURIDAE 422. G. *Tetragonurus cuvieri* SSF 256.2. G1. PEM 14752 - R. 3.4 mm OD, 382 mm TL. G2. PEM 13295 - L. 4.4 mm OD, 475 mm TL. STROMATEIDAE 423. H. *Centrolophus niger* SSF 254.1. H1. PEM 14200 - L. 17.7 mm OD, 447 mm TL. H2. PEM 14592 - R. 27.0 mm OD, 790 mm TL. H3. PEM 14591 - R. 32.5 mm OD, 980 mm TL. Scale bars 1 mm (—).



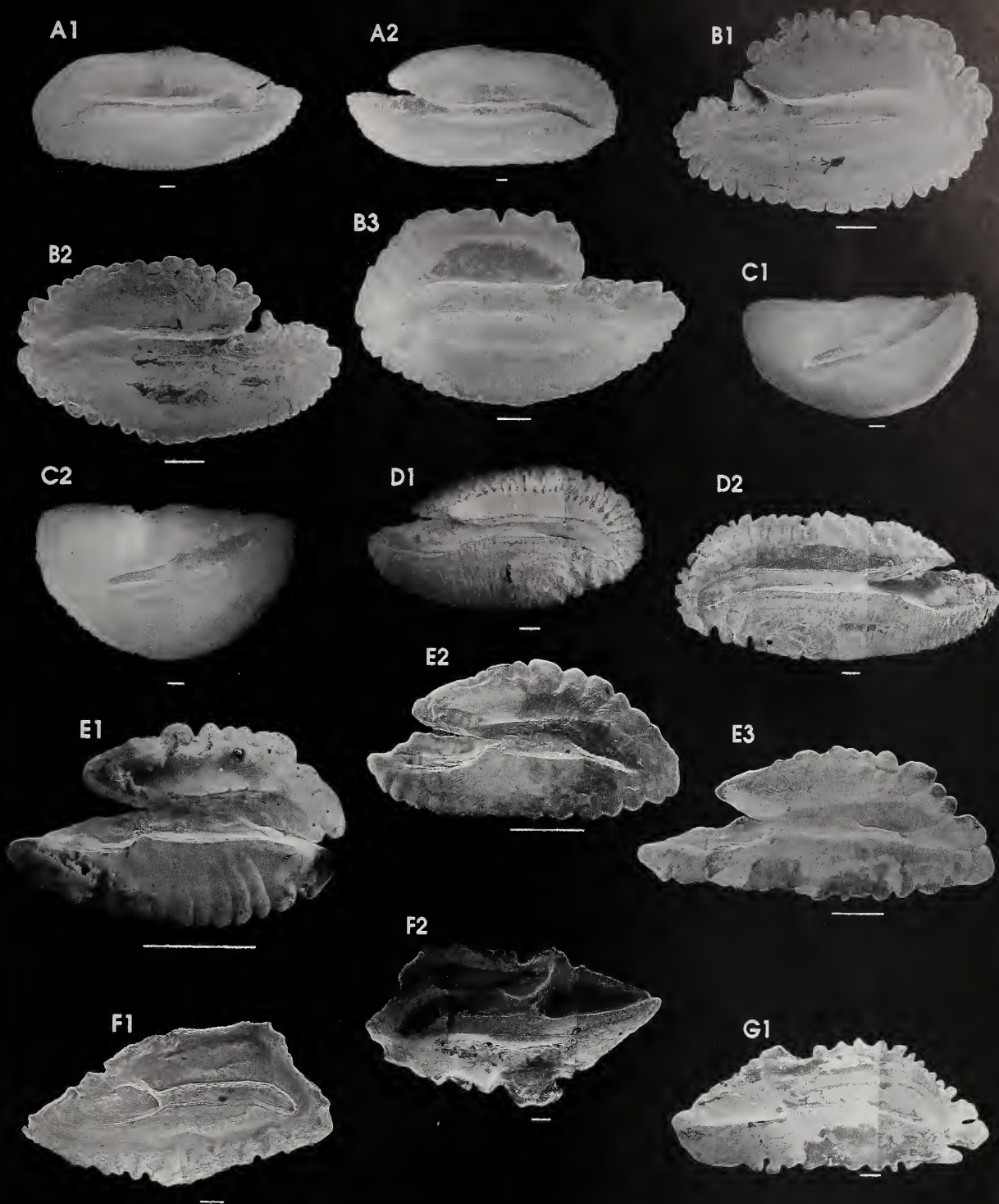


Plate 138. STROMATEIDAE 423 ctd. A. *Hyperoglyphe antarctica* SSF 254.2. A1. PEM 7884 - L. 20.3 mm OD, 710 mm TL. A2. PEM 7883 - R. 28.7 mm OD, 1040 mm TL. B. *H. moselii* SSF 254.3. B1. PEM 14759 - R. 8.5 mm OD, 343 mm TL. B2. PEM 14758 - L. 8.9 mm OD, 324 mm TL. B3. PEM 12138 - L. 11.1 mm OD. C. *Schedophilus huttoni* SSF 254.6. C1. PEM 14600 - L. 15.8 mm OD, 592 mm TL. C2. PEM 14603 - L. 16.8 mm OD, 771 mm TL. D. *S. ovalis* SSF 254.8. D1. 1616H - R. 14.32 mm OD, 415 mm SL. D2. PEM 15487 - L. 19.82 mm OD, 820 mm TL. E. *Stromateus fiatola* SSF 254.10. E1. PEM 4275 - R. 3.16 mm OD, 105 mm TL. E2. PEM 4509 (RUSI 12812) - R. 4.59 mm OD, 167 mm TL. E3. PEM 4653 (RUSI 14953) - R. 7.19 mm OD, 252 mm TL. PSETTODIDAE 432. F. *Psettodes erumei* SSF 257.1. F1. PEM 15475 (RUSI 40617) - R. 13.94 mm OD, 463 mm TL. F2. PEM 0225 - L. 16.44 mm OD, 410 mm TL. G. *Psettodes* sp. SSF 257.-. G1. PEM 0273 - R. 16.38 mm OD, 540 mm TL. Scale bars 1 mm (—).

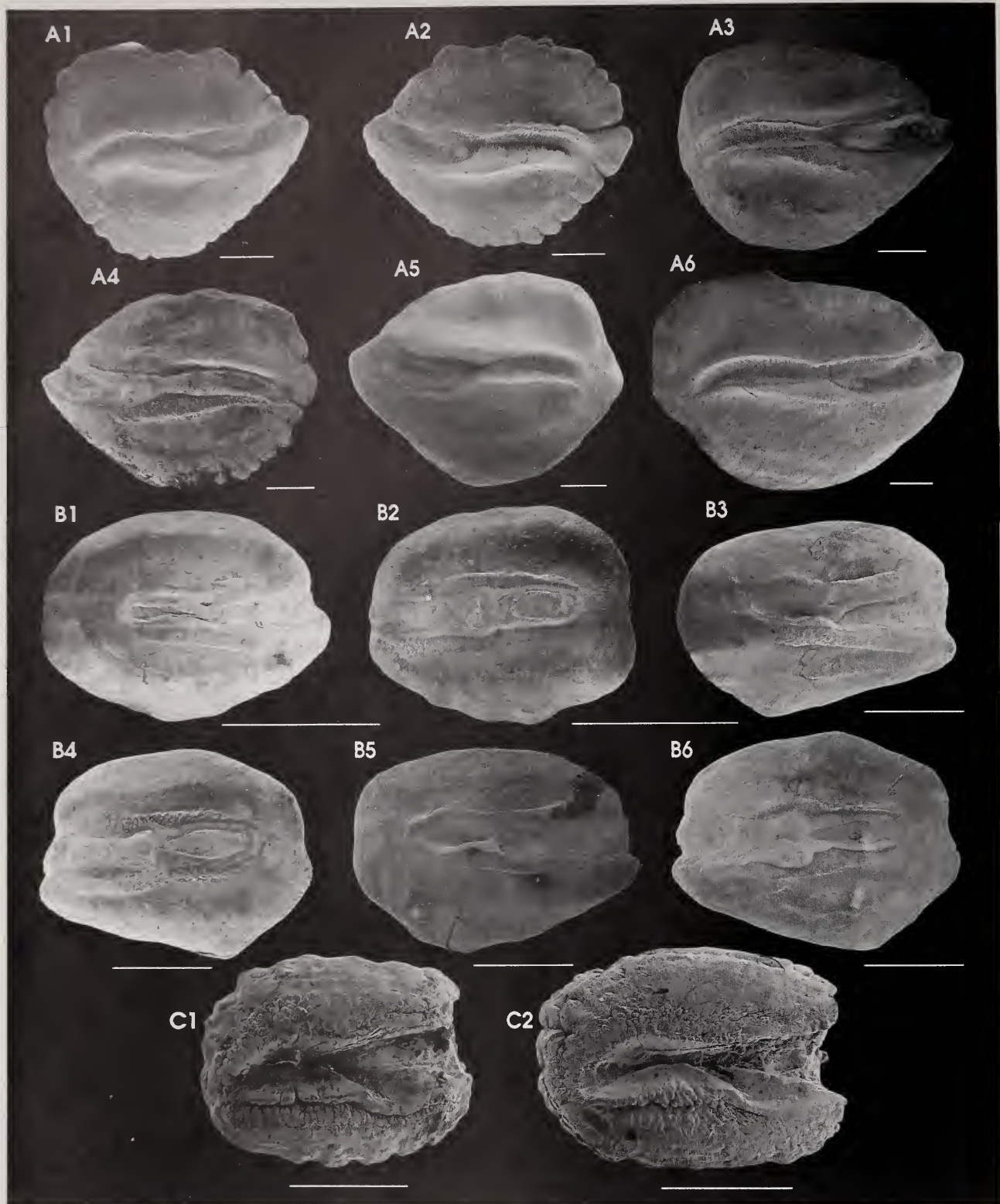


Plate 139. CITHARIDAE 433. A. *Citharoides macrolepis* SSF 258.1. A1. PEM 12967 - L. 5.4 mm OD, 160 mm TL. A2. PEM 12967 - R. A3. PEM 12966 - L. 6.3 mm OD, 197 mm TL. A4. PEM 12966 - R. A5. PEM 12834 (RUSI 34159) - R. 6.3 mm OD, 198 mm TL. A6. PEM 12999 - L. 7.4 mm OD 230 mm TL. BOTIIDAE 434. B. *Arnoglossus capensis* SSF 259.1. B1. PEM 14396 - L. 1.9 mm OD, 84 mm TL. B2. PEM 14396 - R. B3. PEM 15036 - L. 2.9 mm OD, 168 mm TL. B4. PEM 15036 - R. B5. PEM 11661 (RUSI 28487) - L. 2.9 mm OD, 172 mm TL. B6. PEM 11661 - R. C. *Bothus mancus* SSF 259.3. C1. PEM 15641 - L. 2.35 mm OD, 400 mm TL. C2. PEM 14539 - L. 2.6 mm OD, 339 mm TL. Scale bars 1 mm (—).





Plate 140. BOTHIDAE 434 ctd. A. *Chascanopsetta* sp. Kenya form SSF 259.-. A1. PEM 5038 - L. 3.0 mm OD, 276 mm TL. A2. PEM 5038 - R. A3. PEM 5037 - L. 3.85 mm OD, 303 mm TL. A4. PEM 5037 - R. B. *Chascanopsetta* sp. Natal and Mozambique form SSF 259.-. B1. PEM 13037 - L. 1.1 mm OD, 180 mm TL. B2. PEM 13037 - R. B3. PEM 13033 (RUSI 34089) - L. 1.3 mm OD, 170 mm TL. B4. PEM 13033 - R. B5. PEM 13034 (RUSI 34084) - L. 1.5 mm OD, 229 mm TL. B6. PEM 13034 - R. C. *Chascanopsetta* sp. Cape form SSF 259.-. C1. PEM 14424 - L. 1.1 mm OD, 160 mm TL. C2. PEM 14424 - R. C3. PEM 14972 (RUSI 35521) - L. 1.4 mm OD, 157 mm TL. C4. PEM 14972 - R. Scale bars 1 mm (—) or 0.5 mm (|—|).

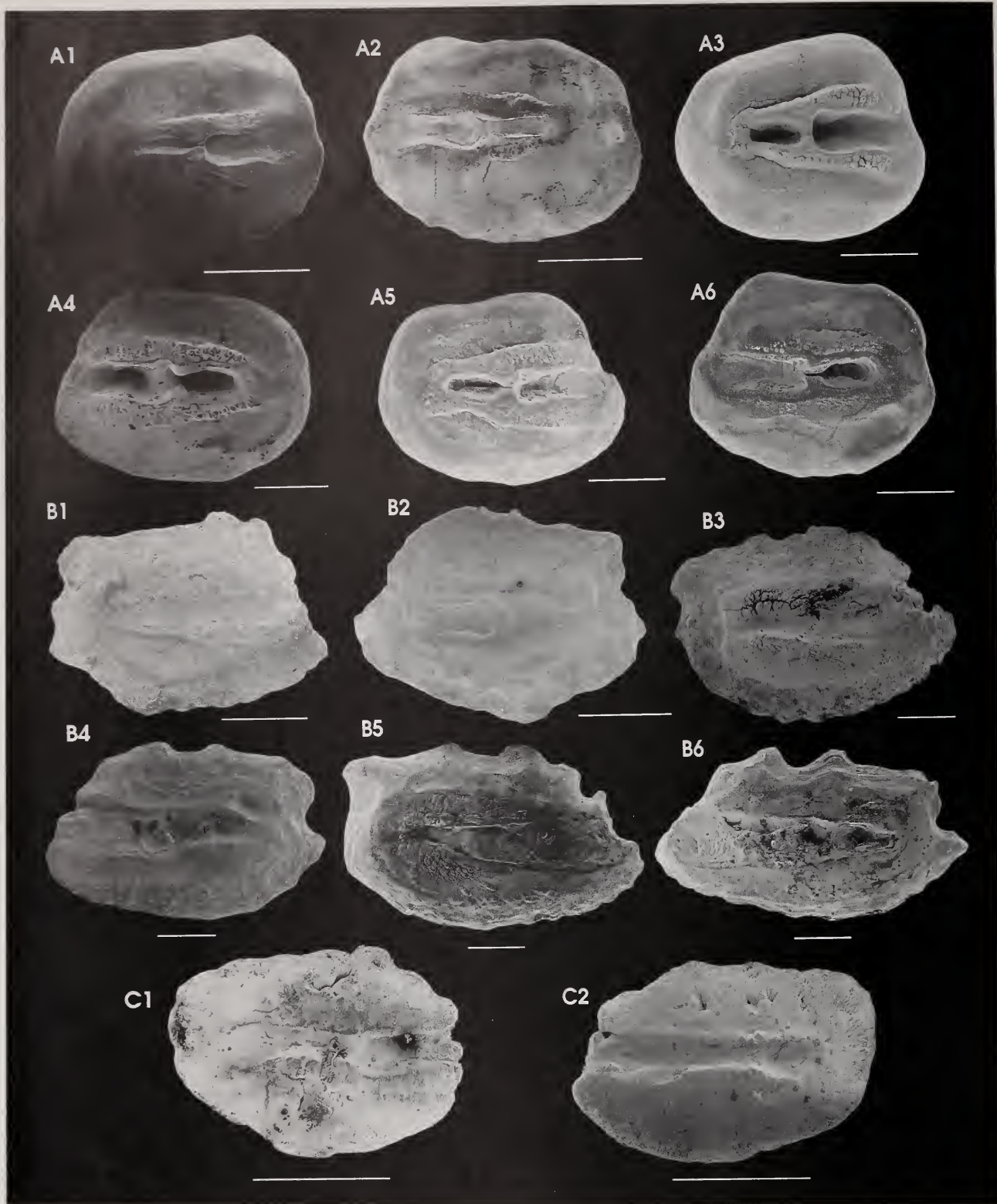


Plate 141. BOTRIIDAE 434 ctd. A. *Laeops pectoralis* SSF 259.13. A1. PEM 12833 (RUSI 28491) - L. 2.65 mm OD, 150 mm TL. A2. PEM 12833 - R. A3. PEM 13001 (RUSI 28491) - L. 3.0 mm OD, 167 mm TL. A4. PEM 13001 - R. A5. PEM 13040 (RUSI 28491) - L. 3.3 mm OD, 174 mm TL. A6. PEM 13040 - R. B. *Pseudorhombus arsius* SSF 259.17. B1. PEM 0838 - L. 3.45 mm OD, 188 mm TL. B2. PEM 0838 - R. B3. PEM 0366 - L. 5.10 mm OD, 260 mm TL. B4. PEM 0366 - R. B5. PEM 1009 - L. 5.58 mm OD, 395 mm TL. B6. PEM 1009 - R. PLEURONECTIDAE 435 C. *Paralichthodes algoensis* - SSF 260.2. C1. PEM 0365 - L. 2.15 mm OD, 140 mm TL. C2. PEM 0365 - R. Scale bars 1 mm (—).





Plate 142. PLEURONECTIDAE 435 ctd. A. *Poecilopsetta natalensis* SSF 260.3. A1. PEM 13002 (RUSI 28478) - L. 3.0 mm OD, 153 mm TL. A2. PEM 13002 - R. A3. PEM 12984 (RUSI 28478) - L. 3.5 mm OD, 165 mm TL. A4. PEM 12984 - R. B. *Samariscus triocellatus* SSF 260.5. B1. 0767H - L. 1.0 mm OD, 62 mm TL. B2. 0767H - R. CYNOGLOSSIDAE 436. C. *Cynoglossus attenuatus* SSF 261.2. C1. PEM 15294 (RUSI 36879) - L. 3.45 mm OD, 215 mm TL. C2. PEM 15294 - R. C3. PEM 6676 - L. 3.5 mm OD, 252 mm TL. C4. PEM 6676 - R. C5. PEM 6675 - L. 4.0 mm OD, 252 mm TL. C6. PEM 6675 - R. C7. PEM 6678 (RUSI 34160) - L. 4.0 mm OD, 233 mm TL. C8. PEM 6678 - R. Scale bars 1 mm (—).

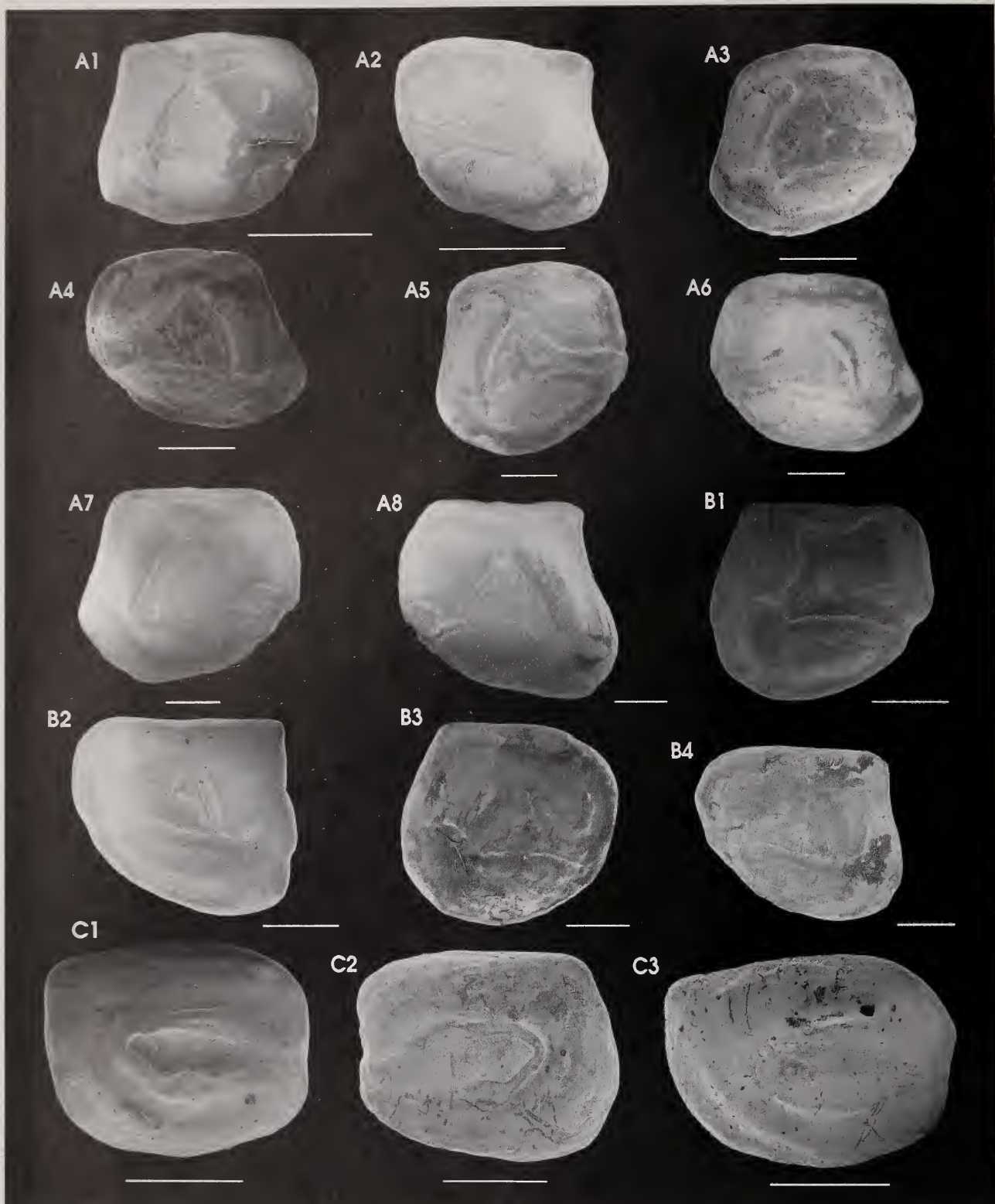


Plate 143. CYNOGLOSSIDAE 436 ctd. A. *Cynoglossus capensis* SSF 261.3. A1. PEM 4318 - L. 2.1 mm OD, 72 mm TL. A2. PEM 4318 - R. A3. PEM 4552 - L. 3.13 mm OD, 139 mm TL. A4. PEM 4552 - R. A5. PEM 2585 - L. 4.2 mm OD, 188 mm TL. A6. PEM 2585 - R. A7. PEM 3352 - L. 4.8 mm OD, 206 mm TL. A8. PEM 3352 - R. B. *Cynoglossus* cf. *capensis* Mozambique form SSF 261.-. B1. PEM 13039 - L. 3.0 mm OD, 162 mm TL. B2. PEM 13039 - R. B3. PEM 12886 - L. 4.2 mm OD, 182 mm TL. B4. PEM 12886 - R. C. *C. marleyi* SSF 261.8. C1. PEM 12987 - L. 2.7 mm OD, 256 mm TL. C2. PEM 12987 - R. C3. PEM 12835 (RUSI 34159) - L. 2.7 mm OD, 198 mm TL. Scale bars 1 mm (—).



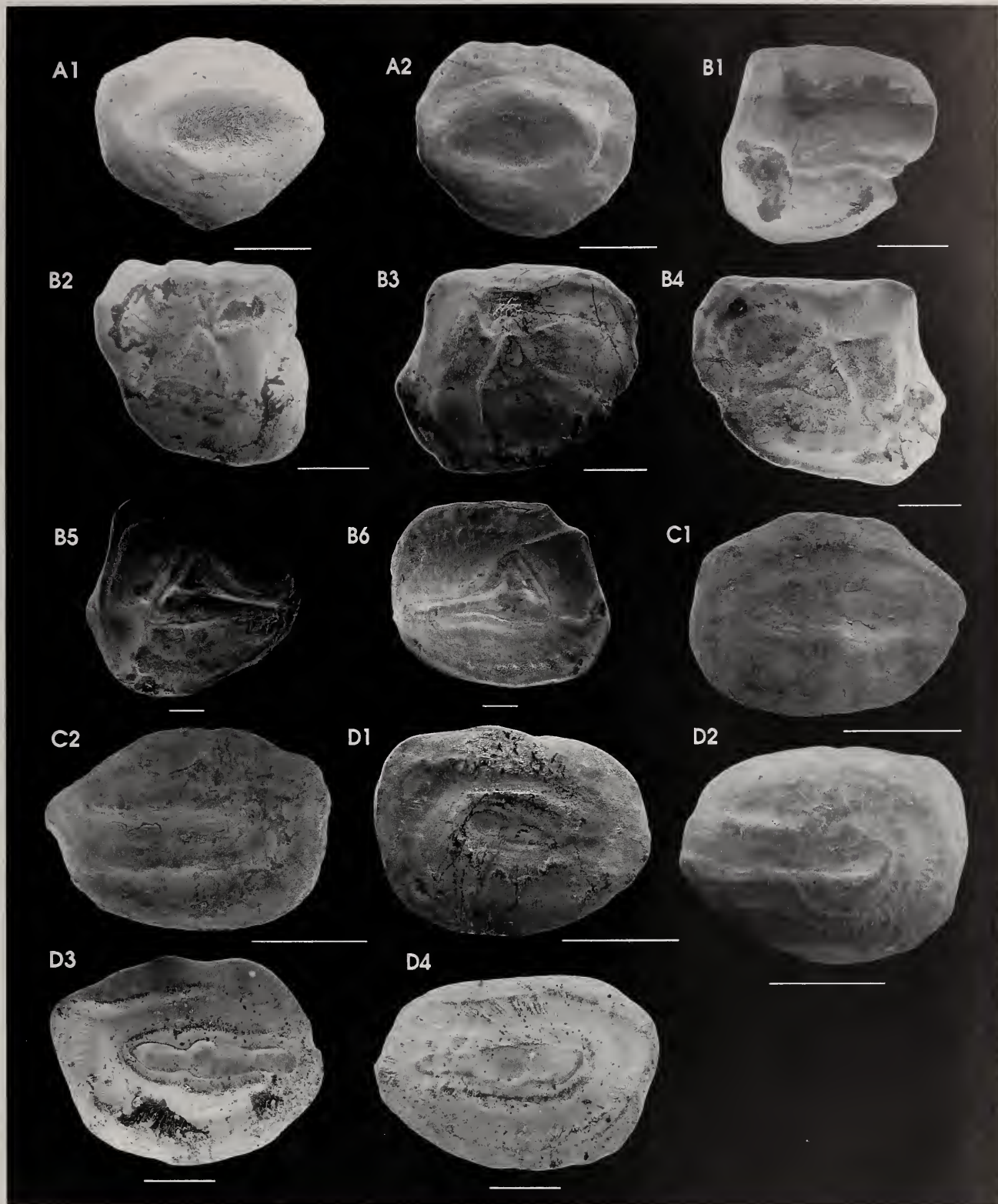


Plate 144. CYNOGLOSSIDAE 436 ctd. A. *Cynoglossus marleyi* SSF 261.8. A1. PEM 12934 - L. 3.1 mm OD, 282 mm TL. A2. PEM 12934 - R. B. *C. zanzibarensis* SSF 261.9. B1. PEM 14431 (RUSI 34095) - L. 3.7 mm OD, 167 mm TL. B2. PEM 14431 - R. B3. PEM 15062 - L. 4.3 mm OD, 240 mm TL. B4. PEM 15062 - R. B5. PEM 15035 - L. 6.6 mm OD, 375 mm TL. B6. PEM 15035 - R. SOLEIDAE 437. C. *Aesopia cornuta* SSF 262.1. C1. PEM 0453 - L. 2.4 mm OD, 135 mm TL. C2. PEM 0453 - R. D. *Austroglossus microlepis* SSF 262.2. D1. PEM 12174 - L. 2.6 mm OD, 169 mm TL. D2. PEM 12174 - R. D3. PEM 12085 - L. 4.4 mm OD, 307 mm TL. D4. PEM 12085 - R. Scale bars 1 mm (—).

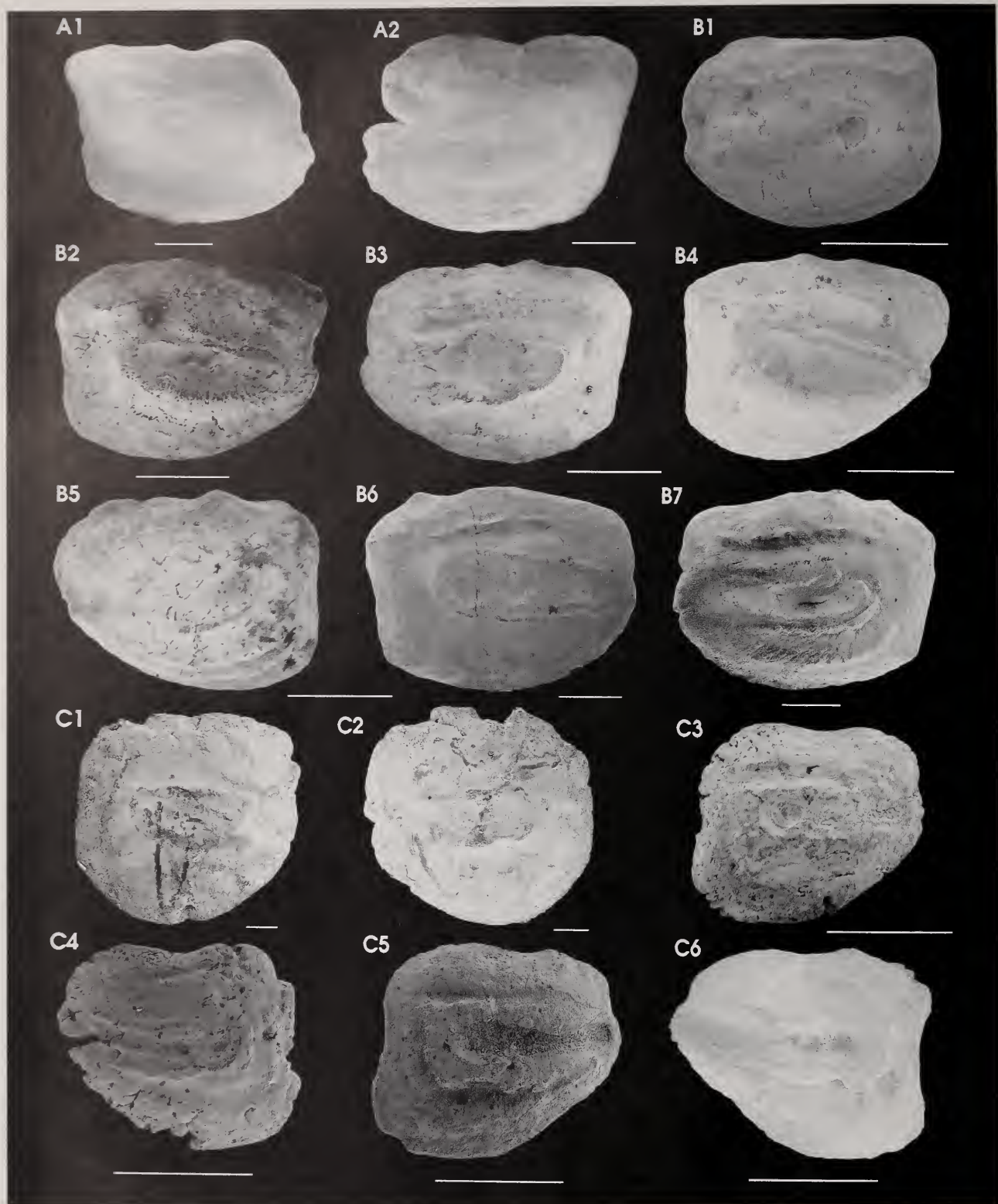
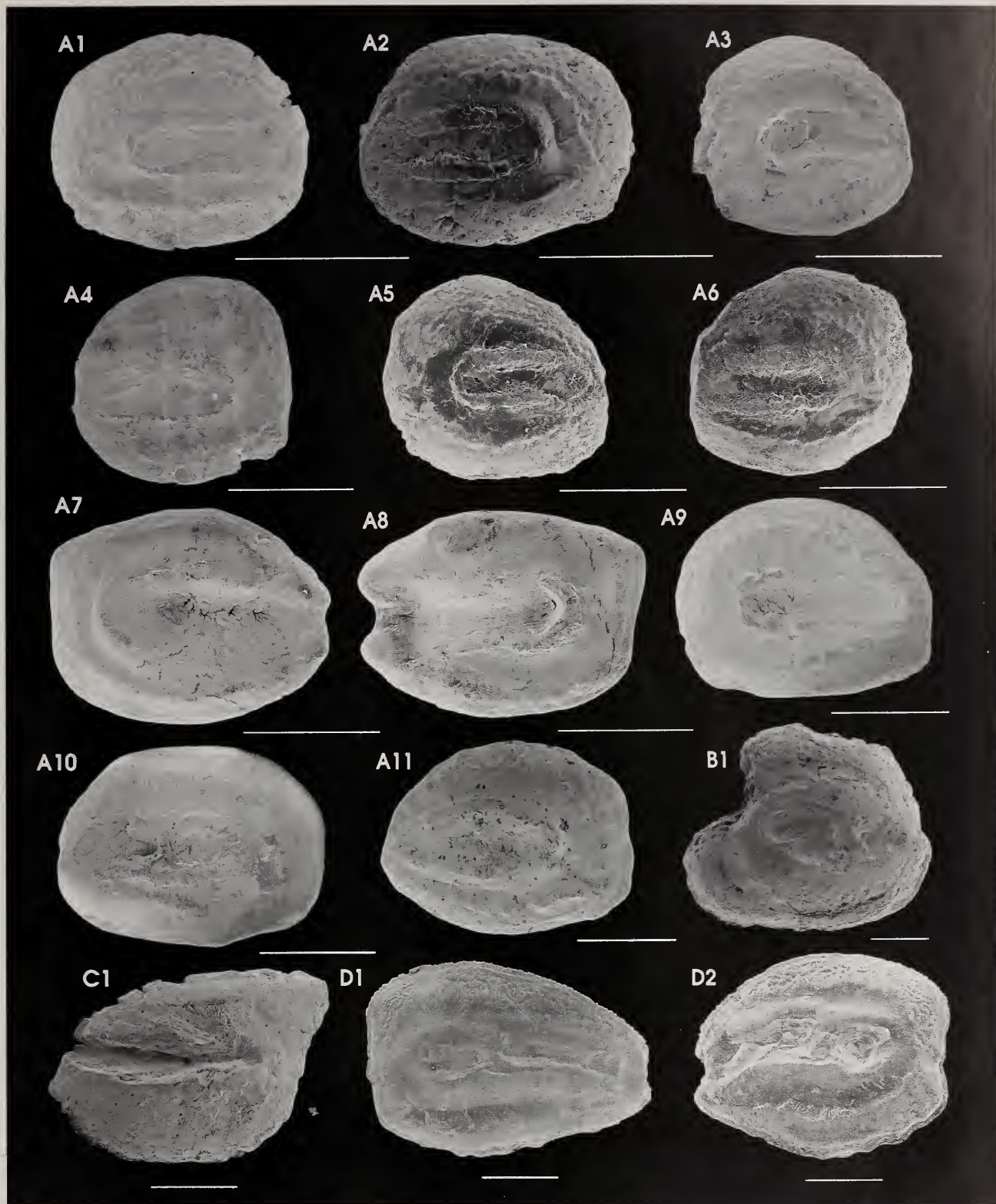


Plate 145. SOLEIDAE 437 ctd. A. *Austroglossus microlepis* SSF 262.2. A1. PEM 12088 - L. 4.8 mm OD, 365 mm TL. A2. PEM 12088 - R. B. *A. pectoralis* SSF 262.3. B1. PEM 4574 (RUSI 13264) - R. 2.2 mm OD, 130 mm TL. B2. PEM 12506 - L. 3.0 mm OD, 176 mm TL. B3. PEM 12506 - R. B4. PEM 12509 (RUSI 28519) - L. 3.0 mm OD, 184 mm TL. B5. PEM 12509 - R. B6. PEM 15037 - L. 4.6 mm OD, 335 mm TL. B7. PEM 15037 - R. C. *Heteromycteris capensis* SSF 262.5. C1. PEM 2160 - L. 0.9 mm OD, 43 mm TL. C2. PEM 2160 - R. C3. PEM 4575 (RUSI 13272) - L. 1.8 mm OD, 92 mm TL. C4. PEM 4575 - R. C5. PEM 4019 - L. 2.05 mm OD, 106 mm TL. C6. PEM 4019 - R. Scale bars 1 mm (—).





**Plate 146. SOLEIDAE 437 ctd.** A. *Solea bleekeri* SSF 262.12. A1. PEM 3740 - L. 1.6 mm OD, 78 mm TL. A2. PEM 3740 - R. A3. PEM 15055 (RUSI 35564) - L. 1.9 mm OD, 96 mm TL. A4. PEM 15055 - R. A5. PEM 15290 (RUSI 36873) - L. 2.05 mm OD, 103 mm TL. A6. PEM 15290 - R. A7. PEM 15054 (RUSI 35564) - L. 2.2 mm OD, 111 mm TL. A8. PEM 15054 - R. A9. PEM 12512 - L. 2.3 mm OD, 128 mm TL. A10. PEM 12512 - R. A11. PEM 12513 - R. 2.8 mm OD, 125 mm TL. B. *S. fulvomarginata* SSF 262.13. B1. PEM 6183 - L. 4.35 mm OD, 265 mm TL. C. *Synaptura marginata* SSF 262.14. C1. PEM 0285 - R. 3.4 mm OD, 290 mm TL. D. *Synapturichthys kleini* SSF 262.15. D1. PEM 2170 - L. 7.6 mm OD, 310 mm TL. D2. PEM 2170 - R. Scale bars 1 mm (—).



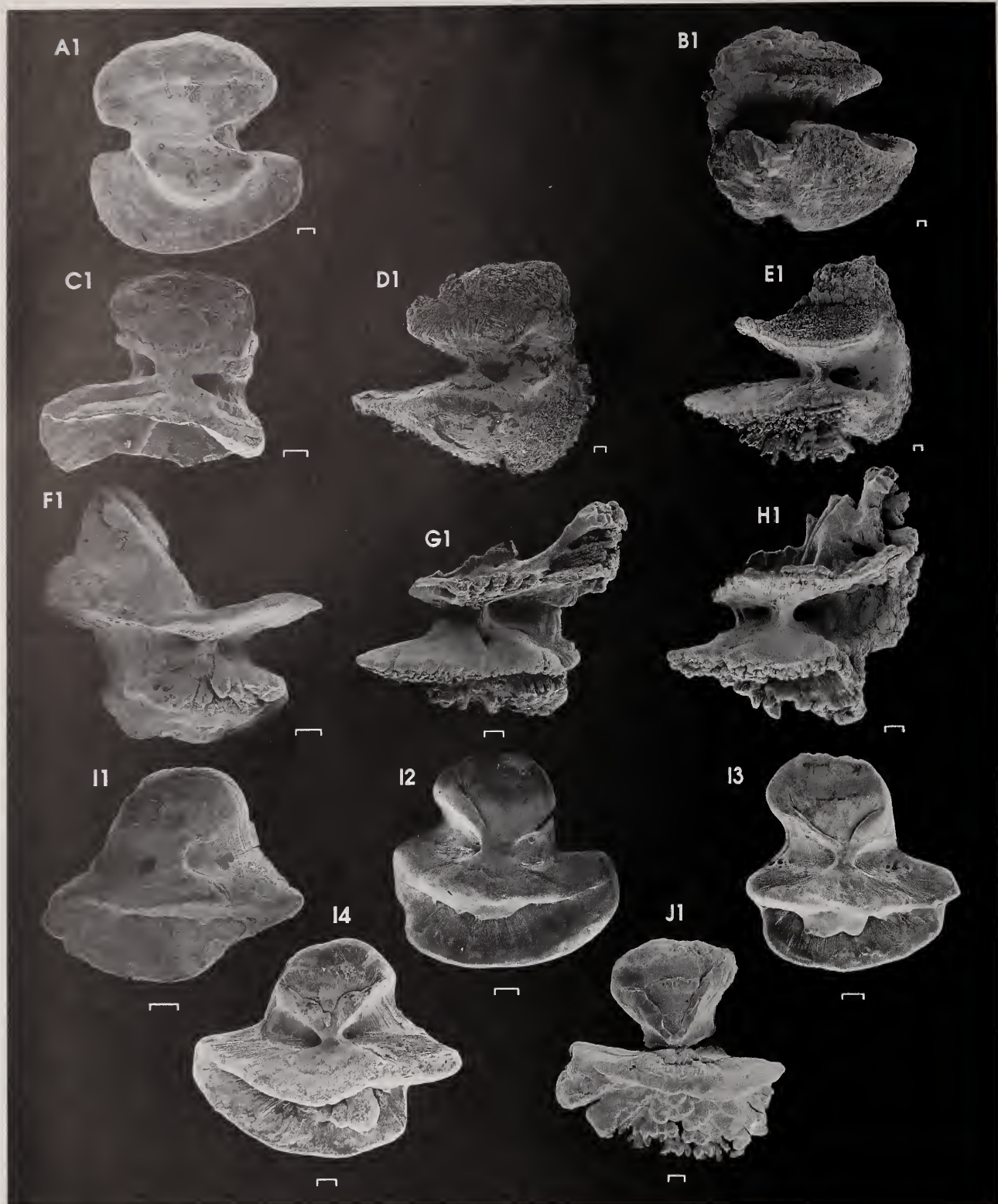


Plate 147. TRIACANTHODIDAE 438. *Macrorhamphosodes* sp. SSF 265.-. A1. PEM 5059 - L. 1.45 mm OD, 107 mm SL. BALISTIDAE 440. B. *Balistapus undulatus* SSF 263.2. B1. 1230H - L. 2.45 mm OD, 220 mm TL. C. *Canthidermis maculatus* SSF 263.6. C1. PEM 15441 (RUSI 40559) - R. 1.05 mm OD, 147 mm TL. D. *Melichthys indicus* SSF 263.7. D1. 0734H - R. 2.15 mm OD. E. *Odonus niger* SSF 263.10. E1. 0733H - R. 2.75 mm OD, 33 mm TL. F. *Rhinecanthus aculeatus* SSF 263.13. F1. PEM 7705 (RUSI 28476) - L. 1.5 mm OD, 68 mm TL. G. *Sufflamen chrysopterus* SSF 263.16. G1. 1390H - R. 1.85 mm OD, 138 mm TL. H. *S. fraenatus* SSF 263.17. H1. 0952H - R. 1.6 mm OD, 189 mm TL. I. *Aluterus monoceros* SSF 264.1. I1. PEM 14810 - L. 1.1 mm OD, 453 mm TL. I2. PEM 15333 - R. 1.05 mm OD, 473 mm TL. I3. PEM 15332 (RUSI 36884) - R. 1.1 mm OD, 510 mm TL. I4. PEM 15331 (RUSI 36883) - L. 1.45 mm OD, 591 mm TL. J. *Cantherhines pardalis* SSF 264.6. J1. 1008H - L. 1.45 mm OD, 179 mm TL. Scale bars 0.1 mm (—).



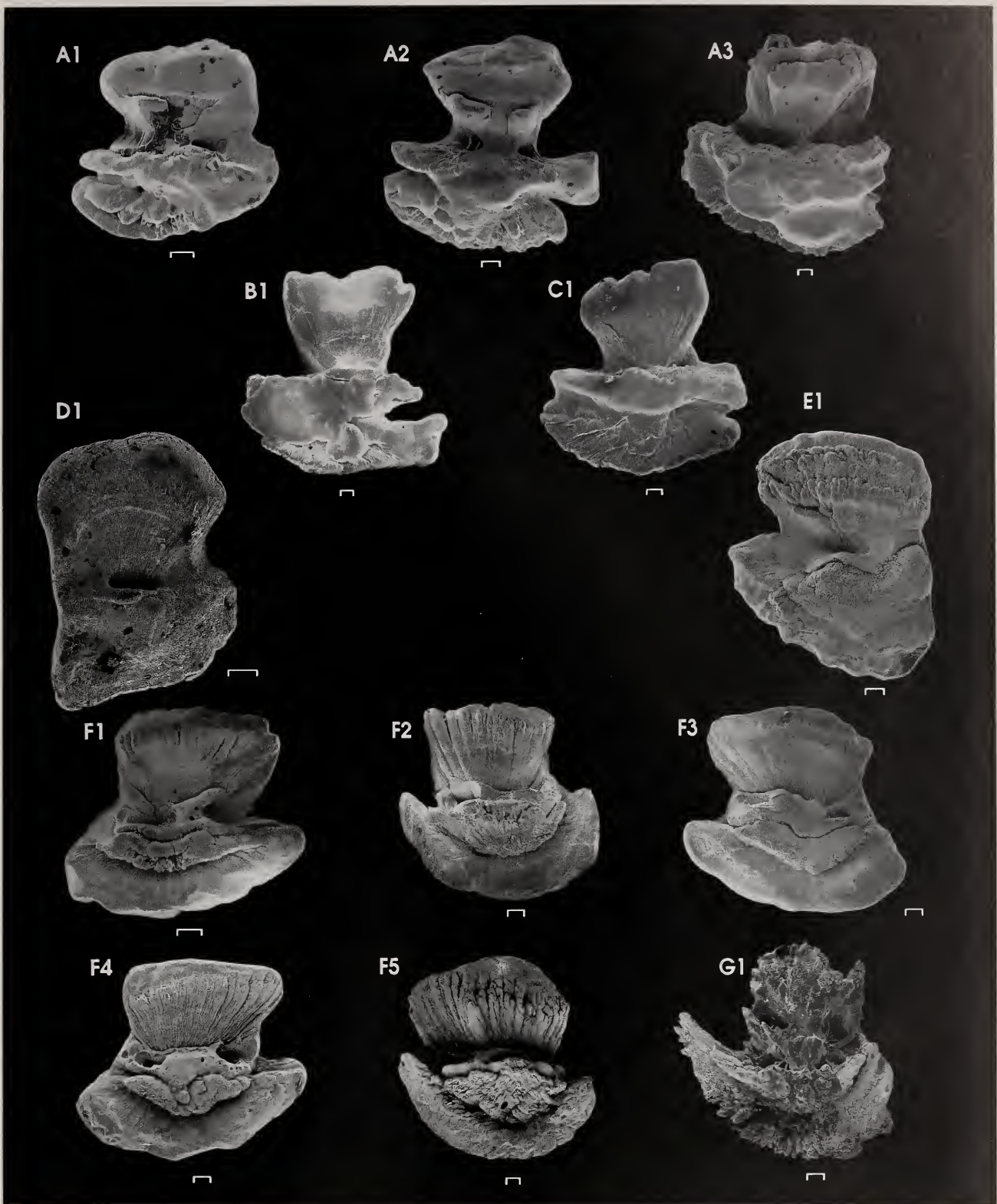


Plate 148. MONACANTHIDAE 440 ctd. A. *Pervagor janthinosoma* SSF 264.11. A1. 1009H - R. 0.85 mm OD, 74 mm TL. A2. 0721H - R. 1.2 mm OD, 89 mm TL. A3. PEM 7706 (RUSI 28480) - L. 1.7 mm OD, 100 mm TL. B. *Thamnaconus fajardoi* SSF 264.15. B1. PEM 15007 (RUSI 35569) - L. 1.8 mm OD, 191 mm TL. C. *T. modestoides* SSF 264.16. C1. PEM 15563 - R. 1.35 mm OD, 150 mm TL. OSTRACIIDAE 441. D. *Lactoria fornasini* SSF 266.5. D1. PEM 15396 (RUSI 40577) - L. 0.65 mm OD, 63 mm TL. E. *Ostracion cubicus* SSF 266.6. E1. 1006H - R. 1.05 mm OD, 96 mm TL. TETRAODONTIDAE 443. F. *Amblyrhynchotes honckenii* SSF 268.1. F1. 0597H - L. 1.05 mm OD, 120 mm TL. F2. PEM 15050 (RUSI 35568) - R. 1.3 mm OD, 181 mm TL. F3. PEM 15048 - R. 1.4 mm OD, 180 mm TL. F4. PEM 15049 - L. 1.5 mm OD, 157 mm TL. F5. PEM 15052 - R. 1.5 mm OD, 192 mm TL. G. *Arothron hispidus* SSF 268.2. G1. PEM 14845 - R. 1.4 mm OD, 168 mm TL. Scale bars 0.1 mm (┐).

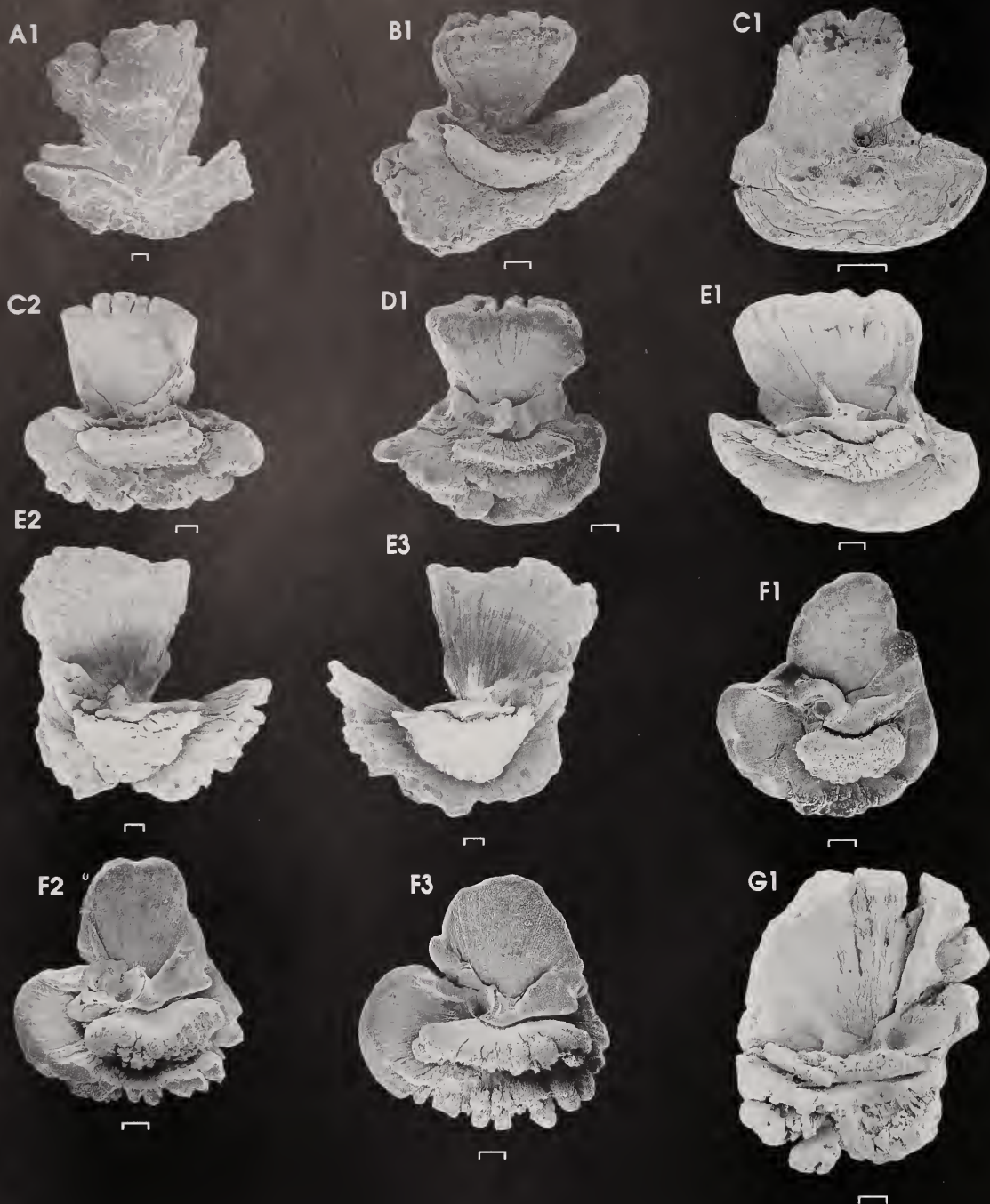


Plate 149. TETRAODONTIDAE 443 ctd. A. *Arothron stellatus* SSF 268.8. A1. PEM 14844 - L. 2.0 mm OD, 355 mm TL. B. *Canthigaster solandri* SSF 268.15. B1. 1282H - L. 1.1 mm OD, 108 mm TL. C. *Lagocephalus guentheri* SSF 268.19. C1. 1393H - L. 0.55 mm OD, 98 mm TL. C2. PEM 0438 - L. 1.1 mm OD, 245 mm TL. D. *L. inermis* SSF 268.20. D1. 0035H - L. 0.9 mm OD, 142 mm TL. E. *L. scleratus* SSF 268.23. E1. 0034H - R. 1.10 mm OD, 135 mm TL. E2. PEM 15375 - L. 1.5 mm OD, 443 mm TL. E3. PEM 15375 - R. F. *Sphoeroides pachygaster* SSF 268.25. F1. PEM 15043 (RUSI 35577) - L. 0.8 mm OD, 171 mm TL. F2. PEM 15044 - L. 1.0 mm OD, 278 mm TL. F3. PEM 15058 - L. 1.0 mm OD, 302 mm TL. DIODONTIDAE 444. G. *Diodon hystrix* SSF 269.6. G1. 0033H - L. 1.6 mm OD, 240 mm TL. Scale bars 0.1 mm (—).





